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RADIATION EXPOSURE COMPENSATION ACT OF 1979

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JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON HEALTH AND SCIENTIFIC RESEARCH

OF THE

COMMITTEE ON LABOR AND HUMAN RESOURCES

AND THE

COMMITTEE ON THE JUDICIARY UNITED STATES SENATE

NINETY-SIXTH CONGRESS

SECOND SESSION

ON

S. 1865

TO AMEND TITLE 28 OF THE UNITED STATES CODE TO MAKE THE UNITED STATES LIABLE FOR DAMAGES TO CERTAIN INDIVIDUALS, TO CERTAIN URANIUM MINERS, AND TO CERTAIN SHEEP HERDS, DUE TO CERTAIN NUCLEAR TESTS AT THE NEVADA TEST SITE OR EMPLOYMENT IN A URANIUM MINE, AND FOR OTHER PURPOSES

JUNE 10, 1980

Ag. tobacco ± C ± C ± 2 U. S.
Uranium miner ± C ± C ± 2 U. S.

Printed for the use of the Committee on Labor and Human Resources

and

the Committee on the Judiciary

Gov. liab. ± 2 U. S.

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WASHINGTON: 1980

Radiation liability ± 2 U. S.
± ∨ Phys. effect.

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RADIATION EXPOSURE COMPENSATION ACT, 1979

TUESDAY, JUNE 10, 1980

U.S. SENATE,
SUBCOMMITTEE ON HEALTH AND SCIENTIFIC RESEARCH
OF THE COMMITTEE ON LABOR AND HUMAN RESOURCES,
AND THE COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:40 a.m., in room 4232, Dirksen Senate Office Building, Senator Howard W. Metzenbaum, presiding pro tempore.

Present: Senators Metzenbaum, Schweiker, Hatch and Pell.

Staff present: Robert M. Wenger, Rhonda Friedman, and Ronald F. Docksai.

OPENING STATEMENT OF SENATOR METZENBAUM

Senator METZENBAUM. The committee will come to order.

This morning, the Subcommittee on Health and Scientific Research is holding a hearing on S. 1865, the Radiation Exposure Compensation Act. This legislation was introduced by Senators Kennedy and Hatch, and cosponsored by myself, along with Senators Cannon, Randolph, Riegle, Schweiker, Javits, Mathias, Garn, and DeConcini. Its major purpose is to require the Federal Government to accept responsibility for its own actions during the 1950's and 1960's—actions that resulted in irreparable harm to American citizens.

During that period of time, because of compelling needs of national security, the Federal Government conducted an extensive series of atmospheric nuclear tests at the Nevada test site. At hearings held last spring, we learned more than had been made public in the previous 20 years about the atmospheric testing program; its health effects, and the nature of the Government deliberations at the time the program took place. And I am sorry to say much of what we have learned is tragic.

We have learned that the Federal Government deliberately and consistently minimized the health effects of fallout from the atmospheric tests.

We have learned that the American people were not convinced of the evidence that was gathered about the uncertainty of the health effects.

We have learned that the Atomic Energy Commission withheld evidence linking radiation from the fallout with high incidences of leukemia and thyroid cancer and deaths of herds of sheep.

We have learned of open hostility within the Atomic Energy Commission to medical staff raising health issues.

We have learned that Americans were sent down into uranium mines to mine the ore to keep the testing program going, despite the fact that it was known that the conditions of the mines were unhealthy and that the cautions that could have been taken to minimize the health risks were not taken.

And we have learned that in the face of all these known factors and uncertainties, an all out public relations campaign was mounted by the Atomic Energy Commission to assure those affected that there was no danger.

We are now just beginning to understand fully the results of the Goverment's failure to protect the health of Americans who live near the test site and who mine uranium. The hearing record of this committee documents the tragedies that the Government allowed to occur.

Dr. Joseph Lyon of the University of Utah, in an article in the New England Journal of Medicine, concluded that a significant excess of leukemia deaths occurred in children up to 14 years of age living in counties in Utah that received high fallout.

An analysis of 3,500 underground uranium miners by the Public Health Service showed that working in those mines significantly increased the incidence of lung cancer.

And Senator Kennedy received a letter on Friday from Dr. Harold Knapp, a scientific analyst for the Atomic Energy Commission from 1960 to 1963, in which Dr. Knapp confirmed his earlier conclusion that the sheep of ranchers whose ranches were near the Nevada test site "would not have died in such great numbers had they not been subjected to the fallout."

In order to get an idea of the magnitude of the injustice, let me cite a comparison to the recent crisis at Three Mile Island.

During that incident, the Governor of Pennsylvania, after consultation with health and nuclear experts, advised evacuation of pregnant women and children living within a 5-mile radius of the reactor where the radiation doses were 2-25 millirems. And yet, no one warned citizens of Utah, Nevada, and Arizona who lived near the Nevada test site and who received radiation doses 40 to 50 times higher than that which triggered the evacuation near Three Mile Island.

No legislation can completely rectify the wrongs that have been committed against this group of American citizens. However, the legislation that is being considered today to do all that can be done 20 years after the fact and tries to guarantee that it can never happen again.

First of all, the legislation would establish a just scheme of compensation.

Second, the legislation would authorize the Secretary of Health and Human Services to conduct a study of the hazardous health effects resulting from the atomic weapons test program conducted at the Nevada test site since 1951.

Third, the legislation would transfer to the Department of Health and Human Services all functions of the Department of Energy relating to research regarding the health effects of radiation on human beings and make the Secretary of Health and

Human Services the coordinator of all Federal programs of research into the health effects of radiation.

This morning we will hear from Senator Domenici, who has introduced his own legislation, S. 1827, to provide benefits to uranium miners and their dependents. We will also hear from a panel of citizens who live near the Nevada test site or who worked in the uranium mines. Finally, we will hear from William Schaffer of the Department of Justice who will spell out the administration's position on this important subject.

Senator Schweiker, do you have a statement?

STATEMENT OF SENATOR SCHWEIKER

Senator SCHWEIKER. Thank you, Mr. Chairman.

The human health hazards posed by exposure to radiation have become a major concern of the American people, dramatized by the accident at Three Mile Island and the continuing debate over the future of nuclear power. Past Health Subcommittee hearings in Washington, D.C., and Salt Lake City, Utah, in which I participated, have examined the state of our knowledge about the dangers of radiation and detailed the legacy of nuclear testing programs and mining operations carried out and regulated by the U.S. Government.

We have found some disturbing evidence that the Government did not level with the people who were exposed to radiation as a result of Government activities. Too often, it has seemed that public relations concerns and Government secrecy took precedence, leading officials to downplay possible health risks.

We have heard the personal, tragic stories of many families who lived in areas blanketed by radioactive fallout from nuclear weapons testing. Uranium miners have told us of their experiences, reporting alarmingly high rates of cancer among fellow workers. The risks were never explained, and even now the Federal Government has taken no responsibility for the consequences of its actions.

Today our subcommittee turns its attention to compensation issues, notably the approach of S. 1865, the Radiation Exposure Compensation Act of 1979. S. 1865 would provide a means of restitution for those who may have been the victims of past Government policies that exposed them to unsafe radiation. While it is true that the loss of a loved one can never be truly compensated for, I believe the Government does have an obligation to face up to the consequences of its actions and deal honestly with those affected.

I want to personally commend Senator Hatch for his leadership in this area. His efforts to expose the full extent of the problem and to devise legislative means to deal with the injuries suffered by his constituents have been critical to the subcommittee's work. His abiding deep concern about the need to establish a responsible forthright Federal policy has spearheaded efforts to formulate compensation legislation.

I also want to acknowledge the important leadership role of Senator Domenici, particularly with respect to uranium miners exposed to radiation before safety standards were in place, as re-

flected in his own bill, S. 1827. I am pleased he will be testifying this morning to outline his concerns and proposals.

These are exceedingly complex questions. Especially given the multiple causes of cancer and its long latency period, it may be difficult or impossible to establish direct causation in most cases. But a fair and responsible Government policy must be developed. I look forward to hearing the views of our witnesses today as the subcommittee continues its review of this most difficult and troubling area of Federal policy.

Thank you, Mr. Chairman.

Senator METZENBAUM. Senator Hatch, do you have a statement?

STATEMENT OF SENATOR HATCH

Senator HATCH. The principal question is no longer whether or not some Utahans, Nevadans, Arizonans, and other citizens were killed or injured by fallout from the atomic tests which began 30 years ago. The question now is how much the Federal Government should compensate the victims and their families, and how we should do this.

When Senator Kennedy and I first began the exploratory process which culminated in legislation we introduced last October, the Federal Government's liability in the Nevada testing was very much an open question. Since then, however, the testimony given at the Salt Lake City hearing last year, as well as additional material I gathered at a similar meeting in St. George, Utah, have led us to an incontrovertible fact. This is that general ignorance about the effects of doses of radiation, faulty communications and bureaucratic lethargy formed a sinister combination of forces without which many who have passed away during the past two decades would today be alive.

Since last fall, many other citizens, organizations, and government representatives have endorsed our viewpoint and have volunteered to assist this united effort to bring just claim to all the victims involved.

Prime among these is the White House Interagency Task Force which, in early February of this year, released a "Report on Compensation for Radiation-Related Illnesses." This is not to say that the Task Force accepts all of the premises Senator Kennedy, I and others involved in the relief effort share. On the other hand, the Task Force, or at least some official position of the White House, has, in my opinion, traveled some considerable distance from where they once stood to the position we hold. Being the optimist I am, subscribing to the power of at least some historical forces, I believe that with time the White House will come all the way over to our position. Then again, after November, I like to think, the position I hold and that of the White House will be one and the same.

Last spring, just prior to this committee's Salt Lake City hearing on the low-level radiation/compensation question, I sponsored a town meeting with the residents of St. George, Utah, giving them a chance to testify. At that time, I made the observation about our Nation's Capital, that Washington, D.C., is a town where people communicate to one another mostly by rumor. One example of such rumor, such statements devoid of authority or truth, is the

notion that S. 1865, the bill we are here to consider, sets some precedent and is entirely unique as a legislative enterprise. Detractors disseminate this assertion coupled with the notion that our legislation will be opening up the proverbial floodgates of Federal largess; that we will serve to inspire all kinds of undeserving citizens to receive free Federal money through a general entitlement.

Let the record note that should our legislation be enacted, it will not be the first, and we pray that it not be the last time our Government pays for damages inflicted on American citizens. In recent years, the Federal Government has already authorized or spent specified sums to resolve or palliate radiation-related problems. For the victims of Hiroshima and Nagasaki, we spent $115 million for studies and long-term medical care. We paid $180 million to clean up uranium tailings piles in several Western States, including Arizona and my home State, Utah. The Federal Government spent $100 million to decontaminate one atoll of the test site in the island of Eniwetok itself. We also spent money for the Bimini Islands.

Considering these actions, I question why the Carter administration is so adamant about negotiating compromises. Why is it so disinclined to spend several tens of millions to provide a semblance of justice for its own citizens who were innocent victims of the crash efforts of the United States to develop its nuclear capabilities? Why is it apparently unwilling to face up to its ultimate responsibility as a Government of the people, that of protecting its own citizens against the external forces set in motion without their knowledge or consent?

As will be well illustrated later by the testimony presented by several Utahans who have come here to help define the definition of the problem, no one involved is looking for a handout. No one of the living victims from Utah or Arizona or Nevada is here for some class action purpose, to argue for something of merit which is nevertheless academic or in which they are merely disinterested parties. All of the citizens with whom this committee has dealt have suffered grievous losses, and this is documented in the many conversations I have shared with, and letters I have read from, citizens and their surviving relatives in each of the States involved.

We have an obligation to come to their aid, providing that which is their due as citizens who have always been faithful to their Government, even at times when their Government has been less than faithful to them. The admirable and never tiring work of Senator Domenici, who graciously agreed to testify before this committee this morning, as well as the legislative efforts of several of us in the Senate and House are in full recognition of this central purpose.

Thank you, Mr. Chairman.

Senator METZENBAUM. Thank you, Senator Hatch.

[The text of S. 1865 follows:]

II

96TH CONGRESS
1ST SESSION

S. 1865

To amend title 28 of the United States Code to make the United States liable for damages to certain individuals, to certain uranium miners, and to certain sheep herds, due to certain nuclear tests at the Nevada Test Site or employment in a uranium mine, and for other purposes.

IN THE SENATE OF THE UNITED STATES

OCTOBER 9 (legislative day, OCTOBER 4), 1979

Mr. KENNEDY (for himself, Mr. HATCH, Mr. CANNON, Mr. RANDOLPH, Mr. RIEGLE, Mr. METZENBAUM, Mr. SCHWEIKER, Mr. JAVITS, Mr. MATHIAS, Mr. GARN, and Mr. DECONCINI) introduced the following bill; which was read twice and referred jointly, by unanimous consent, to the Committees on the Judiciary and Labor and Human Resources

---

A BILL

To amend title 28 of the United States Code to make the United States liable for damages to certain individuals, to certain uranium miners, and to certain sheep herds, due to certain nuclear tests at the Nevada Test Site or employment in a uranium mine, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Radiation Exposure Compensation Act of 1979".

SEC. 2. (a) Title 28 of the United States Code is amended by adding after section 2680 the following new section:

"§ 2681. Liability for certain nuclear tests

"(a) Notwithstanding section 2680(a) of this title, the United States shall be liable—

"(1) for damages to an individual who resided in an affected area for a period of one year between January 1, 1951, and October 31, 1958, or who resided in an affected area between June 30, 1962, and July 31, 1962, and who after January 1, 1952, died from, has, or has had leukemia, thyroid cancer, bone cancer, or any other cancer identified by the Advisory Panel on the Health Effects of Exposure to Radiation and Uranium under section 4 of the Radiation Exposure Compensation Act of 1979;

"(2) for damages to an individual who worked in a uranium mine in Colorado, New Mexico, Arizona, or Utah for at least one year between January 1, 1947, and December 31, 1961, and who after January 1, 1948, died from, has, or has had lung cancer, pulmonary fibrosis, or any other disease or illness identified by the Advisory Panel on the Health Effects of Exposure to Radiation and Uranium under section 4 of the Radiation Exposure Compensation Act of 1979; and

"(3) for damages to a qualified sheep herd.

"(b) In any action filed under subsection (a), the court shall admit and hear evidence upon the question of whether the plaintiff meets the requirements provided in paragraph (1), (2), or (3) of that subsection. If the court determines that the plaintiff meets such requirements, there shall be an irrebuttable presumption that the damages alleged by the plaintiff were caused by exposure to radiation as a result of a nuclear detonation or exposure to uranium as a result of employment in a uranium mine, as the case may be. The court, after a determination that the plaintiff meets such requirements, shall admit and hear evidence solely upon the question of the amount of damages to which the plaintiff is entitled.

"(c) Notwithstanding section 2401(a) of this title, any action commenced for damages described in subsection (a) shall be barred unless—

"(1) with respect to an action for damages described in paragraph (1) or (2) of subsection (a), the complaint is filed—

"(A) within two years after the date on which the report is filed by the Advisory Panel on the Health Effects of Exposure to Radiation and Uranium under section 4(f) of the Radiation Exposure Compensation Act of 1979;

"(B) within two years after the date on which any area is determined to be an affected area under subsection (e)(1)(B), if the individual resides in such affected area and otherwise meets the applicable requirements of paragraph (1) of subsection (a); or

"(C) within two years after the date on which the incidence of cancer is discovered;

whichever is later; or

"(2) with respect to an action for damages described in paragraph (3) of subsection (a), the complaint is filed within two years after the date of the enactment of this section.

"(d)(1) Notwithstanding section 2678 of this title, no attorney shall charge, demand, receive, or collect for services rendered pursuant to an action brought under subsection (a), fees in excess of 15 per centum of the amount of any judgment rendered under subsection (a) or in excess of 15 per centum of the amount of any award, compromise, or settlement made pursuant to section 2672 of this title for a cause of action under subsection (a).

"(2) Any attorney who charges, demands, receives, or collects for services rendered in connection with such claim any amount in excess of that allowed under this subsection, if

recovery be had, shall be fined not more than $2,000, or imprisoned not more than one year, or both.

"(e) For the purposes of this section, the term—

"(1) 'affected area' means—

"(A) in the State of Utah, the counties of Millard, Sevier, Beaver, Iron, Washington, Kane, Garfield, Piute, Wayne, San Juan, Grand, Carbon, Emery, Duchesne, Uintah, Sanpete, and Juab; in the State of Nevada, the counties of White Pine, Nye, Lander, Lincoln, and Eureka; and that part of Arizona that is north of the Grand Canyon and west of the Colorado River; and

"(B) any other area within the United States determined by the Secretary of Health, Education, and Welfare to have received a high level of fallout as a result of the nuclear detonations at the Nevada Test Site between January 1, 1951, and October 31, 1958, or between June 30, 1962, and July 31, 1962; and

"(2) 'qualified sheep herd' means any sheep herd which is the subject of an action commenced prior to the date of the enactment of this section for damages caused to the herd by the Nancy nuclear detonation on

March 24, 1953, or the Harry nuclear detonation on May 19, 1953.

"(f)(1) Subject to the provisions of paragraph (2), the right to bring a civil action under this section is in addition to, and not in lieu of, any other remedy provided by a Federal law or program which provides for compensation or reimbursement to such person for damages described in subsection (a). The filing of an action under this section does not affect the rights of any person under such Federal law or program.

"(2) Any award for damages under this section shall be reduced by the amount of compensation or reimbursement that such person has received, or is entitled to receive, under any such Federal law or program.".

(b) The table of sections for chapter 171 of title 28, United States Code, is amended by adding at the end thereof the following:

"2681. Liability for certain nuclear tests.".

SEC. 3. Section 1346 of title 28, United States Code, is amended by adding at the end thereof the following:

"(g) The district court shall have exclusive original jurisdiction of any civil action under section 2681 of this title for damages recoverable under that section due to exposure to radiation or uranium.".

SEC. 4. (a) ESTABLISHMENT OF ADVISORY PANEL; RULES FOR CONDUCTING BUSINESS.—(1) There is established within the National Cancer Institute an Advisory Panel on the Health Effects of Exposure to Radiation and Uranium (hereinafter in this section referred to as the "Advisory Panel"), which shall consist of seven persons not otherwise employed by the United States, appointed by the Director of the National Cancer Institute without regard to the provisions of title 5, United States Code, relating to appointments in the competitive civil service.

(2) Members of the panel shall be appointed from among individuals who are distinguished in the subject of the health effects in human beings caused by exposure to radiation and uranium.

(3) The Advisory Panel shall be appointed, and shall convene, within three months of the date of enactment of this section.

(4) The Director of the National Cancer Institute shall designate one of the members of the Advisory Panel to serve as Chairman.

(5) The Advisory Panel shall meet at the call of the Chairman, or at the call of a majority of the members. Five members shall constitute a quorum for the conduct of business.

(6) A vacancy in the Advisory Panel shall not affect its powers, but shall be filled in the manner in which the original appointment was made.

(b) FUNCTIONS OF THE ADVISORY PANEL.—(1) The Advisory Panel shall identify, for the purposes of recovery under section 2681 of title 28, United States Code, those types of cancer, other than leukemia, thyroid cancer, or bone cancer, that are more likely than other cancers to develop in human beings after exposure to low level radiation, and those diseases and illnesses, other than lung cancer and pulmonary fibrosis, that are more likely than other diseases and illnesses to develop in human beings who worked in uranium mines for at least one year between January 1, 1947, and December 31, 1961.

(2) The Advisory Panel may undertake an investigation or study of any appropriate matter which is necessary in order to carry out its functions under this subsection.

(3) In order to avoid duplication of effort, the Advisory Panel may, in lieu of or as part of any necessary study or investigation required or otherwise conducted under this subsection, use a study or investigation conducted by another entity.

(4) The Advisory Panel may, for the purposes of carrying out its functions under this subsection, hold such hearings, sit and act at such times and places, take such testi-

mony, and receive such evidence, as the Advisory Panel considers advisable.

(c) ASSISTANCE FROM FEDERAL AGENCIES.—(1) The Advisory Panel is authorized to obtain from any department, bureau, agency, board, commission, office, independent establishment or instrumentality of the executive branch of the Federal Government, records, reports, statistics, and any other information for the purposes of carrying out its functions under this section. Such records, reports, statistics, and any other information shall be furnished to the extent permitted by law and within available resources.

(2) The Advisory Panel shall promptly arrange for such security clearances for its members and appropriate staff as are necessary to obtain access to classified information needed to carry out its functions under this section.

(3) In any case in which the Advisory Panel obtains information under this subsection, the Advisory Panel shall not disclose any information exempt from disclosure under section 552(a) of title 5, United States Code, by reason of paragraphs (4) and (6) of subsection (b) of such section.

(d) PERSONNEL ASSISTANCE AND SUPPORT SERVICES.—(1) The Director of the National Cancer Institute shall, at the request of the Advisory Panel, appoint such staff personnel as may be necessary to enable the Advisory Panel to carry out its functions under this section. Such personnel

shall be appointed subject to the provisions of title 5, United States Code, governing appointments in the competitive service, and shall be paid in accordance with the provisions of chapter 51 and subchapter III of chapter 53 of such title relating to classification and General Schedule pay rates.

(2) Upon request by the Director of National Cancer Institute, the head of any Federal agency is authorized to detail, on a reimbursable basis, any of the personnel of such agency to the Advisory Panel to assist it in carrying out its functions under this section.

(3) The Director of the National Cancer Institute may procure, on behalf of the Advisory Panel, temporary and intermittent services to the same extent as is authorized by section 3109(b) of title 5, United States Code, but at rates for individuals not to exceed the daily equivalent of the annual rate of basic pay in effect for grade GS–18 of the General Schedule.

(4) The Administrator of General Services shall provide to the Advisory Panel on a reimbursable basis such administrative support services as the Advisory Panel may request.

(e) COMPENSATION OF MEMBERS.—Each member of the Advisory Panel shall be entitled to the daily equivalent of the annual rate of basic pay in effect for grade GS–18 of the General Schedule for each day of service (including travel-time) during which they are engaged in the actual perform-

ance of duties vested in the Commission. While so serving away from their homes or regular places of business, they shall be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code, for persons employed by the Government intermittently.

(f) REPORT TO CONGRESS; TERMINATION.—(1) No later than nine months after the date the Advisory Panel convenes as required under paragraph (3) of subsection (a), the Advisory Panel shall file a report with the Congress setting forth its findings pursuant to paragraph (1).

(2) The Advisory Panel shall continue in existence until three months after the date the report is filed under paragraph (1) of this subsection.

(g) FEDERAL ADVISORY COMMITTEE ACT.—The Advisory Panel is not subject to the provisions of the Federal Advisory Committee Act.

(h) AUTHORIZATIONS.—There are authorized to be appropriated such sums as may be necessary to carry out the provisions of this section.

SEC. 5. Section 301(b)(2) of the Public Health Service Act (42 U.S.C. 241(b)(2)) is amended by adding at the end thereof the following:

"(C) The Secretary shall conduct, and may support through grants and contracts, a compre-

hensive assessment of the adverse health effects resulting from the atomic weapons test program conducted at the Nevada Test Site since January 1, 1951. For the purposes of carrying out this subparagraph, there are authorized to be appropriated $2,000,000 for the fiscal year ending September 30, 1980, and for each of the subsequent four fiscal years.".

SEC. 6. (a) There are transferred to the Department of Health, Education, and Welfare all functions of the Department of Energy relating to research regarding the health effects of radiation on human beings, including those functions described in sections 31 through 33 of the Atomic Energy Act of 1954 and sections 103 and 107 of the Energy Reorganization Act of 1974, which relate to research regarding the health effects of radiation on human beings.

(b) To the extent necessary or appropriate to perform functions and carry out programs transferred by this section, the Secretary of Health, Education, and Welfare may exercise, in relation to the functions so transferred, any authority available by law, including appropriation Acts, to the official or agency from which such functions were transferred.

(c) The Secretary of Health, Education, and Welfare shall coordinate all Federal programs of research into the health effects of radiation.

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(d) The provisions of this section shall become effective one year after the date of enactment of this Act.

Senator METZENBAUM. Senator Domenici, we are very happy to have you with us this morning.

STATEMENT OF HON. PETE V. DOMENICI, A U.S. SENATOR FROM THE STATE OF NEW MEXICO

Senator DOMENICI. Thank you very much, Mr. Chairman, and members of the committee.

First, let me quickly identify the scope of my testimony and of my long-term concern. I am here to talk only about uranium miners' problems. I started work on this issue in 1977, Mr. Chairman. I have a different approach as to how we should compensate these miners, but I do want to congratulate Senator Kennedy, Senator Hatch, and this committee for its interest. If we are going to get bogged down for a long time in terms of measuring damages to the fallout victims and how we are going to identify them, I would hope that this committee—and the other committees of jurisdiction as well—would focus in on the uranium miners' issue. This it is a much more identifiable problem. Providing compensation for illnesses incurred on the job is not unique. This tradition of compensating people for work-related illnesses is reflected in our black lung law and in our workers' compensation laws.

I want to share with you today the benefits of what I learned about uranium miners and the genesis of my idea as to how we ought to compensate them and their families.

Thank you for the opportunity to testify. As I indicated, my remarks will focus on our Nation's early uranium miners and on the difficulties they and their survivors are encountering in their attempts to secure adequate compensation.

The health problems of uranium miners who had been overexposed to radiation during the 1950's and 1960's were documented as early as 1967 when the Joint Committee on Atomic Energy conducted hearings on "Radiation Exposure of Uranium Miners." Testifying at that time, then acting Surgeon General Leo Gehrig stated, and I quote:

> According to evidence collected by the Public Health Service, it is abundantly clear that there is a severe health problem among uranium miners resulting from excessive radiation exposure. To date, there have been 98 lung cancer fatalities among this group, many of which have occurred since 1963.

He went on to project that, within the next 20 years, the possibility existed that a total of 529 lung cancer deaths among uranium miners in the PHS study group could occur.

During a hearing conducted by your committees in June of last year, Dr. Joseph Wagoner, formerly a Special Assistant for Occupational Carcinogenesis at the Occupational Safety and Health Administration, and a member of the Public Health Service Research Team, to which I have just alluded, indicated that, according to his last formal count in 1974, 144 cancer deaths had been observed among the 3,500 uranium miners he had been observing in the Four Corners States of New Mexico, Utah, Arizona, and Colorado. The expected death rate from lung cancer for this group is 29.8—this leaves 114 instances of what doctors term excess deaths.

Another study detailing instances of cancer among 700 nonwhite, primarily American Indian miners through 1974, indicates that 11 cases of cancer have been uncovered where 2.58 would have been

expected. I further understand that doctors at Shiprock, N. Mex., have, independently of the figures I just quoted, discovered 16 cases of lung cancer among the Navajo miners whom they serve.

The foregoing evidence alone, which outlines only a small part of the entire problem, is conclusive and alarming. I wish that I could say that the numbers are all in. But it appears, unfortunately, that this trend is continuing. These men are still paying, with their health and with their lives, for the Federal Government's inaction during the early years in the area of uranium mine safety and health.

In addition to the disabling health problems which these men are experiencing, they and their survivors are also the victims of deficient State workmen's compensation statutes which did not—until the mid-1960's at the earliest—begin to pay compensation for occupationally linked, radiation-induced diseases arising out of uranium mine employment. The hearing I held last August in Grants, N. Mex., confirmed for the record that our early miners have, for the most part, "fallen through the cracks" of State workmen's compensation programs, and are still not receiving the compensation they need and deserve.

The testimony I received during the Grants hearing prompted me to introduce Senate bill 1827, a substantially improved version of a uranium miners' compensation measure I introduced during the 95th Congress. S. 1827 establishes a fully federally-financed mechanism for providing compensation and medical benefits to those disabled miners who worked prior to mid 1971 when the Federal Metal and Non-Metallic Mine Safety Act—the first act establishing health and safety standards for uranium mines—was implemented. Compensation will also be paid to the survivors of the early miners according to a set schedule.

As currently written, the remedy contained in S. 1827 is not exclusive with respect to the ability of the injured party to pursue alternate routes, such as the court system, to secure compensation for damages. However, I am exploring the possibility of making S. 1827 exclusive in nature and the sole remedy for this particular class of injured persons and their survivors. To date, the majority of those miners and survivors who have sought compensation through the courts, either in actions against private employers or in suits against the Government, have not been successful. It may be that S. 1827, if amended to make it an exclusive remedy, will, by eliminating the need for time consuming and costly litigation, guarantee that the largest number of claimants are compensated in the most equitable, expeditious and efficient manner.

We agree that the U.S. Government, the sole procurer of uranium during the period 1948–1962, was seriously remiss in its responsibility to make certain that uranium mining operations were carried out in a manner which ensured worker health and safety. The fact that excessive numbers of uranium miners who worked during this period are now contracting disabling and fatal diseases as the direct result of Federal inaction is an American tragedy.

However, Mr. Chairman, I believe that we have spent too much time trying to assess blame in this situation. The fact of the matter is that this was an unfortunate era in our Nation's history which not one of us would ever want to go back and relive. Our focus now

should be on getting the job done with respect to our early miners and their survivors. I believe that the administrative remedy contained in S. 1827 represents an opportunity to do just that, and I look forward to working with you, and the other members of the Senate Judiciary Committee and the Senate Labor and Human Resources Committee as the measure proceeds through Congress.

I stress to those of you who serve on both committees that the uranium miners' issue is clear cut. Their issue is an historic one. The remedies are historic in this country. We need not delay any longer. An option is to go with an exclusive remedy containing a stepped up Workmen's Compensation schedule and let the Federal Government pay the entire thing. We will then end up covering most of the uranium miners and many of their heirs. My thinking at this time is that this is preferable to the long delays occasioned by the pursuit of common law remedies. I truly believe equity would be better served if all those eligible were promptly provided with an administrative remedy.

Thank you, Mr. Chairman.

Senator METZENBAUM. Thank you, Senator Domenici for a very thought provoking statement.

[The prepared statement of Senator Domenici follows:]

STATEMENT OF PETE V. DOMENICI

BEFORE THE

SENATE LABOR AND HUMAN RESOURCES COMMITTEE

AUGUST 27, 1980

MR. CHAIRMAN, MEMBERS OF THE SENATE COMMITTEE ON LABOR AND HUMAN RESOURCES. I AM PLEASED TO HAVE THE OPPORTUNITY TO TESTIFY BEFORE YOUR COMMITTEE TODAY TO DISCUSS THE SUBJECT OF COMPENSATION FOR THE VICTIMS OF OCCUPATIONAL DISEASES. MY TESTIMONY WILL FOCUS ON HEALTH AND COMPENSATION ISSUES AS THEY RELATE TO OUR NATION'S EARLY URANIUM MINERS -- THOSE WHO WORKED DURING THE 1950'S AND 1960'S BEFORE IMPLEMENTATION BY THE FEDERAL GOVERNMENT OF ADEQUATE HEALTH AND SAFETY STANDARDS FOR URANIUM MINES. AS YOU WELL KNOW, THESE TWO DECADES WERE ALSO CHARACTERIZED BY DEFICIENT STATE WORKERS' COMPENSATION SYSTEMS WHICH DID NOT, FOR THE MOST PART, PROVIDE COMPENSATION TO MINERS WHO CONTRACTED DISEASES AS THE RESULT OF THEIR URANIUM MINE EMPLOYMENT.

MY INVOLVEMENT WITH THE PROBLEMS OF THE EARLY URANIUM MINERS BEGAN THREE YEARS AGO -- IN AUGUST OF 1977 -- WHEN I MET ON THE NAVAJO RESERVATION WITH MR. HARRY TOME, A NAVAJO TRIBAL COUNCILMAN. DURING OUR MEETING, MR. TOME ALERTED ME TO THE FACT THAT SIGNIFICANT NUMBERS OF NAVAJO MINERS WERE EXPERIENCING DISABLING AND ALL TOO FREQUENTLY FATAL ILLNESSES, PRIMARILY LUNG CANCERS, WHICH THEY ATTRIBUTED TO URANIUM MINE WORK. THESE DISCUSSIONS PROMPTED ME TO INTRODUCE A URANIUM MINERS' COMPENSATION MEASURE, S. 3199, DURING THE 95TH CONGRESS. IN AUGUST OF LAST YEAR, I CONDUCTED A FIELD HEARING IN GRANTS, NEW MEXICO -- THE HEART OF URANIUM COUNTRY. THERE I LEARNED AGAIN, FROM THE GRANTS MINERS AND FROM THE NAVAJO MINERS, ABOUT THE HEALTH PROBLEMS THEY WERE EXPERIENCING. SUBSEQUENT

TO THAT HEARING, I INTRODUCED S. 1827,. THE "URANIUM MINERS' COMPENSATION ACT", A REVISED AND IMPROVED VERSION OF S. 3199. I HAVE ALSO SPOKEN TO THIS ISSUE ON TWO SEPARATE OCCASIONS HERE IN WASHINGTON -- ON JUNE 19, 1979 AND ON JUNE 10, 1980 -- WHEN THE SENATE JUDICIARY COMMITTEE AND THE SENATE SUBCOMMITTEE ON HEALTH AND SCIENTIFIC RESEARCH CONDUCTED JOINT HEARINGS ON THIS AND OTHER ISSUES.

DURING THE PAST 18 MONTHS, WE HAVE WITNESSED WIDESPREAD INTEREST IN THIS ISSUE BY THE PRESS AND THE PUBLIC. IT IS IMPORTANT TO NOTE, HOWEVER, THAT THE MATTER IS A LONG-STANDING ONE. THE HEALTH PROBLEMS OF THE EARLY URANIUM MINERS WERE DOCUMENTED AS EARLY AS 1967 WHEN THE JOINT COMMITTEE ON ATOMIC ENERGY CONDUCTED HEARINGS ON "RADIATION EXPOSURE OF URANIUM MINERS." TESTIFYING AT THAT TIME, THE ACTING SURGEON GENERAL, LEO GEHRIG, STATED, AND I QUOTE: "ACCORDING TO EVIDENCE COLLECTED BY THE PUBLIC HEALTH SERVICE, IT IS ABUNDANTLY CLEAR THAT THERE IS A SEVERE HEALTH PROBLEM AMONG URANIUM MINERS RESULTING FROM EXCESSIVE RADIATION EXPOSURE. TO DATE, THERE HAVE BEEN 98 LUNG CANCER FATALITIES AMONG THIS GROUP, MANY OF WHICH HAVE OCCURRED SINCE 1963." DR. GEHRIG WENT ON TO PROJECT THAT, WITHIN THE NEXT 20 YEARS, THE POSSIBILITY EXISTED THAT A TOTAL OF 529 LUNG CANCER DEATHS AMONG THE 3,500 URANIUM MINERS IN THE PHS STUDY GROUP COULD OCCUR.

DURING A JUNE 19, 1979 HEARING CONDUCTED BY THE SENATE JUDICIARY COMMITTEE AND THE SENATE SUBCOMMITTEE ON HEALTH AND SCIENTIFIC RESEARCH, DR. JOSEPH WAGONER, FORMERLY A SPECIAL ASSISTANT FOR OCCUPATIONAL CARCINOGENESIS AT THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, AND A MEMBER OF THE AFOREMENTIONED PHS RESEARCH TEAM, INDICATED THAT, ACCORDING TO HIS LAST FORMAL COUNT IN 1974, 144 CANCER

DEATHS HAD OCCURRED AMONG THE 3,500 URANIUM MINERS HE HAD BEEN OBSERVING IN THE FOUR CORNERS STATES OF NEW MEXICO, UTAH, ARIZONA AND COLORADO. THE EXPECTED DEATH RATE FROM LUNG CANCER FOR THIS GROUP IS 29.8 -- THIS LEAVES 114 INSTANCES OF WHAT DOCTORS TERM "EXCESS DEATHS". ANOTHER STUDY DETAILING INSTANCES OF CANCER AMONG 700 NON-WHITE, PRIMARILY AMERICAN INDIAN MINERS THROUGH 1974 INDICATED THAT 11 CASES OF CANCER HAD BEEN UNCOVERED WHERE 2.58 WOULD HAVE BEEN EXPECTED. I FURTHER UNDERSTAND THAT DOCTORS AT SHIPROCK, NEW MEXICO HAVE, INDEPENDENTLY OF THE FIGURES I JUST QUOTED, DISCOVERED 16 CASES OF LUNG CANCER AMONG THE NAVAJO MINERS WHOM THEY SERVE. THE FOREGOING EVIDENCE ALONE, WHICH OUTLINES ONLY A SMALL PART OF THE ENTIRE PROBLEM, IS CONCLUSIVE AND ALARMING. I WISH THAT I COULD SAY THAT THE NUMBERS ARE ALL IN. BUT IT APPEARS, UNFORTUNATELY, THAT THIS TREND IS CONTINUING. I AM STILL RECEIVING LETTERS FROM URANIUM MINERS WHO HAVE RECENTLY BEEN STRICKEN WITH LUNG CANCER AND OTHER MINE-RELATED DISEASES AND FROM THE RELATIVES OF THOSE WHO HAVE JUST RECENTLY DIED. THESE MEN ARE STILL PAYING -- WITH THEIR HEALTH AND WITH THEIR LIVES -- FOR THE FEDERAL GOVERNMENT'S INACTION DURING THESE TWO DECADES IN THE AREA OF URANIUM MINE HEALTH AND SAFETY.

IN ADDITION TO THE DISABLING AND FREQUENTLY FATAL HEALTH PROBLEMS WHICH THESE MINERS ARE EXPERIENCING, THEY AND THEIR FAMILIES ARE THE VICTIMS OF DEFICIENT STATE WORKERS' COMPENSATION SYSTEMS WHICH EXCLUDE THEM FROM RECEIVING THE BENEFITS AND MEDICAL PAYMENTS TO WHICH THEY ARE ENTITLED. I UNDERSTAND THAT ONE OF THE EXPERTS ON THE DIFFICULTIES ENCOUNTERED BY THESE MINERS IN THEIR

ATTEMPTS TO SECURE COMPENSATION UNDER EXISTING STATE WORKERS' COMPENSATION PROGRAMS IS HERE WITH US TODAY -- MR. GEORGE HARRISON -- AN ATTORNEY FROM MY STATE OF NEW MEXICO. GEORGE TESTIFIED TO THIS ISSUE AT MY HEARING IN GRANTS LAST YEAR. I KNOW THAT HE CAN SPEAK MORE EXPERTLY THAN I TO THE SPECIFIC DEFICIENCIES IN STATE COMPENSATION PROGRAMS WHICH AFFECT THESE URANIUM MINERS -- PROBLEMS WITH STATUTES OF LIMITATIONS, CAUSATION ISSUES, AND BURDEN OF PROOF REQUIREMENTS -- AND I WILL LEAVE THAT TASK TO HIM. I WOULD LIKE TO THANK GEORGE FOR COMING HERE TODAY. THE MEMBERS OF THE COMMITTEE CAN BE ASSURED THAT THEY WILL BENEFIT A GREAT DEAL FROM HIS EXPERT TESTIMONY.

THE URANIUM MINERS' COMPENSATION MEASURE THAT I HAVE INTRODUCED IN THIS CONGRESS, S. 1827, ALTHOUGH GENERALLY ACKNOWLEDGED BY THOSE CLOSE TO THE ISSUE AS A "STEP IN THE RIGHT DIRECTION" IS STILL IN NEED OF IMPROVEMENT. I LOOK TO YOU, MR. CHAIRMAN, AND TO THE EXPERTS ON YOUR COMMITTEE STAFF FOR HELP IN REFINING THE BILL. I TAKE THIS OPPORTUNITY TO DISCUSS THE MEASURE'S BASIC GOALS.

S. 1827 IS DESIGNED TO "FILL THE GAPS" IN EXISTING STATE WORKERS' COMPENSATION PROGRAMS BY ESTABLISHING A FULLY FEDERALLY FINANCED ADMINISTRATIVE MECHANISM FOR PROVIDING COMPENSATION AND MEDICAL BENEFITS TO AFFLICTED MINERS WHO WORKED DURING THE 1950s AND 1960s. AN AFFLICTED URANIUM MINER WHO WORKED FOR THREE YEARS OR MORE IN ONE OR MORE URANIUM MINES PRIOR TO THE IMPLEMENTATION OF THE FEDERAL METAL AND NON-METALLIC MINE SAFETY ACT IN MID-1971 IS POTENTIALLY ELIGIBLE FOR BENEFITS UNDER THE ACT. COMPENSABLE DISEASES INCLUDE LUNG CANCER, BRONCHIAL CANCER, LYMPHATIC CANCER, PULMONARY FIBROSIS, SILICOSIS AND ANY OTHER DISEASES WHICH THE SECRETARY CONCLUDES IS RADIATION OR DUST-INDUCED AND WHICH RESULTED

FROM EMPLOYMENT AS A URANIUM MINER. IN ADDITION TO PROVIDING PAYMENT IN FULL FOR MEDICAL COSTS ASSOCIATED WITH A MINER'S ILLNESS, THE BILL ALSO AUTHORIZES CONTRACTS AND GRANTS FOR THE CONSTRUCTION AND OPERATION OF FIXED-SITE AND MOBILE CLINICAL FACILITIES FOR THE ANALYSIS, EXAMINATION AND TREATMENT OF AFFLICTED MINERS.

AS YOU ARE AWARE, THE FEDERAL GOVERNMENT WAS THE SOLE PROCURER OF URANIUM DURING THE PERIOD 1948-1962. IN ITS HASTE TO EXTRACT SUFFICIENT QUANTITIES OF URANIUM NEEDED FOR WEAPONS PRODUCTION, THE UNITED STATES GOVERNMENT FAILED TO USE ALREADY AVAILABLE SCIENTIFIC EVIDENCE AND MEDICAL DATA TO UPGRADE HEALTH AND SAFETY STANDARDS IN THE MINES. IT WAS NOT UNTIL THE YEAR 1971 THAT THE FEDERAL METAL AND NON-METALLIC MINE SAFETY ACT OF 1966 -- THE FIRST CONGRESSIONAL ACT MANDATING STANDARDS FOR URANIUM MINES -- WAS FULLY IMPLEMENTED.

ONE WOULD HAVE THOUGHT THAT THE PROCUREMENT AGENCY, THE ATOMIC ENERGY COMMISSION, WOULD HAVE TAKEN IT UPON ITSELF TO INSURE THAT URANIUM MINING OPERATIONS WERE CARRIED OUT IN A MANNER WHICH RESPECTED THE HEALTH AND SAFETY NEEDS OF THE URANIUM MINE WORKERS. HOWEVER, THE STATUTE AUTHORIZING THE COMMISSION SPECIFICALLY STATED THAT AEC'S REGULATORY AUTHORITY OVER URANIUM WOULD COMMENCE ONLY AFTER THE ORE WAS REMOVED FROM "ITS PLACE OF DEPOSIT IN NATURE". THIS LANGUAGE PERMITTED THE AEC TO ESCAPE, FROM A LEGAL POINT OF VIEW, RESPONSIBILITY FOR STANDARD SETTING IN THE MINES.

HOWEVER, TO THE BEST OF MY KNOWLEDGE, THERE WAS NOTHING IN THE 1954 ATOMIC ENERGY ACT WHICH PRECLUDED THE COMMISSION FROM WRITING INTO ITS CONTRACTS HEALTH AND SAFETY STIPULATIONS FOR THE CONTRACTORS TO FOLLOW. UNFORTUNATELY, HOWEVER, THIS WAS NOT DONE. IT WAS NOT UNTIL 1967 THAT THE SECRETARY OF THE DEPARTMENT OF LABOR, ACTING UNDER THE AUTHORITY GRANTED HIM BY THE WALSH-HEALEY PUBLIC CONTRACTS ACT, TOOK IT UPON HIMSELF TO PROMULGATE A STANDARD FOR RADIATION EXPOSURE IN THE MINES. QUITE FRANKLY, I DO NOT UNDERSTAND WHY THE DEPARTMENT OF LABOR TOOK SUCH A LONG TIME TO PROMULGATE A STANDARD, NOT DO I UNDERSTAND WHY THE OTHER FEDERAL AGENCIES INVOLVED DID NOT ATTEMPT CONSTRUCTIVE ACTION. THE EVIDENCE WAS AVAILABLE, BUT THE PRINCIPALS INVOLVED WERE NOT MOVED TO ACT. ALTHOUGH THE CONGRESS DID EVENTUALLY IMPLEMENT HEALTH AND SAFETY STANDARDS FOR URANIUM MINES, THE IMPLEMENTATION OF THESE STANDARDS OCCURRED TOO LATE TO BENEFIT THOSE MINERS WHO ARE SUFFERING TODAY THE ILL EFFECTS OF THEIR URANIUM MINE WORK. THE RECORD ON THIS ISSUE IS AN EXAMPLE OF BUREAUCRATIC BUCK PASSING AT ITS BEST. IT REFLECTS HUNDREDS OF STUDIES, MEETINGS, CONFERENCES AND TELEPHONE CALLS. MOST, BUT NOT ALL OF THEM CONTAINING A SUFFICIENT REASON FOR NOT DOING ANYTHING AT THE TIME, BUT ADDING UP OVER A PERIOD OF YEARS TO A TOTALLY UNJUSTIFIABLE LACK OF NEEDED ACTION. MR. CHAIRMAN, MEMBERS OF THE COMMITTEE I BELIEVE THAT THE CASE FOR FEDERAL RESPONSIBLITY AND FEDERAL LIABILITY WITH RESPECT TO THIS PARTICULAR CLASS OF MINERS IS CLEAR CUT.

THE FACT THAT YOUR COMMITTEE IS EXPLORING THREE BILLS DESIGNED TO COMPENSATE OCCUPATIONAL DISEASE VICTIMS -- LEGISLATION INTRODUCED BY SENATORS HOLLINGS AND THURMOND FOR THE TEXTILE WORKERS, SENATOR HART'S ASBESTOSIS BILL, AND MY URANIUM MINERS' MEASURE, POINTS TO THE NEED FOR SOME KIND OF COMPREHENSIVE SOLUTION TO THE PROBLEMS OF INADEQUACIES IN STATE WORKERS' COMPENSATION SYSTEMS

AS THEY RELATE TO THE VICTIMS OF OCCUPATIONAL DISEASES. YOU HAVE BEEN ATTEMPTING FOR QUITE SOME TIME TO REACH THAT SOLUTION WITH S. 420, LEGISLATION SETTING MINIMUM FEDERAL STANDARDS FOR THE STATES TO FOLLOW. ALTHOUGH I DO NOT KNOW THAT S. 420 IS THE BEST WAY TO GO, I DO KNOW THAT YOU AND I SHARE AN INTEREST IN INSURING THAT THOSE OF OUR NATION'S WORKERS WHO HAVE BENEFITTED OUR SOCIETY BY THEIR YEARS OF PRODUCTIVE WORK IN CERTAIN HAZARDOUS INDUSTRIES SHOULD NOT BE LEFT UNATTENDED TO BY WORKERS' COMPENSATION SYSTEMS. I COMMEND YOU FOR YOUR DILIGENT EFFORTS TO COME TO GRIPS WITH THIS INCREDIBLY COMPLEX AND IMPORTANT ISSUE WHICH I HOPE WILL ULTIMATELY BE RESOLVED IN A MANNER WHICH IS FAVORABLE TO THE WORKERS INVOLVED AND TO THEIR FAMILIES.

A URANIUM MINERS' COMPENSATION BILL OF SOME KIND OR ANOTHER HAS ALSO BEEN IN THE WORKS FOR QUITE SOME TIME NOW. LEGISLATION TO COMPENSATE THESE WORKERS WAS INTRODUCED IN THE 94TH CONGRESS BY SENATOR MONTOYA AND CONGRESSMAN LUJAN. I INTRODUCED COMPENSATION MEASURES OF MY OWN DURING THE 95TH AND 96TH CONGRESSES. I UNDERSTAND THAT THE TYPE OF REMEDY PROPOSED BY S. 1827 DOES NOT FIT INTO A COMPREHENSIVE TYPE OF SOLUTION TO THE PROBLEMS OF INADEQUATE STATE WORKERS' COMPENSATION PLANS. HOWEVER, I ALSO MAINTAIN THAT THE EARLY URANIUM MINERS CANNOT WAIT FOR THIS COMPREHENSIVE SOLUTION -- WORTHWHILE GOAL THAT IT IS. THEY ARE IN NEED NOW. THEY ARE NOT RECEIVING THE MEDICAL BENEFITS AND COMPENSATION WHICH THEY DESPERATELY NEED. THE SOCIAL SECURITY BENEFITS AND WELFARE PAYMENTS WHICH MANY OF THEM ARE RECEIVING ARE INADEQUATE. IN MOST CASES, THESE MEN ARE THE BREADWINNERS FOR THEIR FAMILIES -- IN THE CASE OF THE INDIAN MINERS, THOSE FAMILIES ARE OFTEN QUITE LARGE. I CERTAINLY INTEND TO CONTINUE IN MY COMMITMENT TO OBTAIN, AS PROMPTLY AS POSSIBLE, A FEDERALLY-FINANCED

ADMINISTRATIVE REMEDY FOR THIS CLASS OF MINERS WHICH WILL BE AS WORKABLE, EQUITABLE AND GENEROUS AS IT CAN POSSIBLY BE.

I WOULD LIKE TO TAKE THIS OPPORTUNITY TO ACKNOWLEDGE THE WORK OF OTHER SENATORS INTERESTED IN THIS ISSUE. AS YOU KNOW, SENATORS KENNEDY, HATCH, RANDOLPH, RIEGLE, METZENBAUM, SCHWEIKER, JAVITS, MATHIAS, DECONCINI, LAXALT AND GARN ARE ALL SPONSORS OF S. 1865, LEGISLATION TO COMPENSATE URANIUM MINERS AND FALLOUT VICTIMS. ALTHOUGH THE APPROACH CONTAINED IN S. 1865 DIFFERS SIGNIFICANTLY FROM THAT CONTAINED IN S. 1827, WE ALL SHARE A COMMON GOAL -- THE PROVISION OF BENEFITS TO THE AFFLICTED MINERS AND TO THEIR FAMILIES. I PARTICULARLY WANT TO EXPRESS MY APPRECIATION TO SENATORS HATCH AND SCHWEIKER FOR THE SUPPORT THEY HAVE PROVIDED TO ME IN MY EFFORTS.

MR. CHAIRMAN, LET ME EXTEND MY APPRECIATION TO YOU FOR CALLING THESE HEARINGS AND FOR TAKING THE TIME TO HEAR ME SPEAK ON BEHALF OF THE AFFLICTED URANIUM MINERS AND TO DISCUSS SENATE BILL 1827. I COMMEND AND THANK YOU AND YOUR STAFF FOR ALL OF THE HARD WORK YOU HAVE PUT INTO THESE HEARINGS, AND I LOOK FORWARD TO WORKING WITH YOU ON THIS AND OTHER ISSUES IN THE FUTURE.

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Senator METZENBAUM. Would you care to introduce the staff person?

Senator DOMENICI. This is Eileen Winkelman. She has been working on this matter for me for well over 2 years.

Senator METZENBAUM. Happy to have her with us as well.

Your legislation and our legislation do indeed represent different approaches to try to solve the same problem but they both recognize that there is a problem. I would like to ask you a couple of questions regarding the premises of your proposals.

From your investigations, is it clear that the uranium mine workers have actually suffered greater than normal health problems as a result of working in the mines?

Senator DOMENICI. It is absolutely clear that uranium miners during the fifties and most of the sixties did receive excessive doses of radiation, principally because standards for circulation of air, a simple proposition as that, were inadequate. There is no doubt in this senators mind about this fact.

It is also clear to me from my discussions with the early miners and early mine inspectors, and from my inspections of some of the old mines, that there is no comparison, from a health and safety standpoint, between the conditions in the mines during the fifties and sixties and conditions in the uranium mines of today.

Senator METZENBAUM. There is no evidence, is there, that either the mine owners or the Government took any precautionary steps, or gave any kind of advice to the miners working there regarding their subjection to extra hazards?

Senator DOMENICI. I think it is fair to say that during this era, there was a great deal of confusion as to which Federal agency, if any, was responsible for setting safety and health standards in the uranium mines. The Atomic Energy Commission's authorizing statute stated that the Commission's jurisdiction over uramium was not to begin until after the ore had been removed from its place of deposit in nature. This statutory language permitted the AEC to escape—from a legal point of view—its responsibility for the health and safety of uramium mine workers. Although some of the individual States did take it upon themselves to institute health and safety standards, there was no single Federal agency to which the States could look for guidance. The net result was that not a great deal was accomplished at either the State or Federal level in the area of setting standards and in the area of warning the miners about the hazards to which they were being exposed.

Senator METZENBAUM. As I understand your position, there is no question in your mind that the Federal Government should take some action to compensate these afflicted mine workers. The determination whether it is the Domenici approach or the Kennedy-Hatch et al. approach is a subject for the Committee to decide. But your point is some action should be taken and very promptly.

Senator DOMENICI. Absolutely. I have, on several occasions, discussed with the victims and with attorneys the difficulties that this particular class of miners have encountered under existing State workers' compensation programs. Burden of proof requirements and statutes of limitations which vary from State to State make it almost impossible for them and their survivors to collect under workers' compensation.

My approach says that we will treat them all the same. They will get a very stepped up workmen's compensation benefit. If they are still alive, they will get it themselves. If they are dead, we will provide for compensation to their heirs, as most workmen's compensation systems do. There could be lump sum settlement as there are under workmen's compensation laws.

Senator METZENBAUM. Senator Schweiker, questions?

Senator SCHWEIKER. I do not have any questions.

I do want to commend Senator Domenici for his work in this area. I can certainly empathize with what he is doing. I know the kind of problems he is confronting, since I come from a State with a lot of coal miners and have had to fight similar battles for a number of years, when there was no attention paid to important health concerns, no interest in Government, no empathy whatsoever. I have seen the personal human tragedies of mining families. I can understand why he is concerned and why he feels that the responsibilities of the Government should be as he has outlined today.

I am pleased to have him here to give testimony on this important matter.

Senator DOMENICI. Senator Schweiker, I have spoken to you about this matter in terms of my bill. I want to take this occasion to thank you for spending some time with me. As you are aware, the primary jurisdiction over S. 1827 rests with the Labor and Human Resources Committee on which you serve.

I would like to say something to you and to the members of the committee with reference to the uranium miners. If we do not get something reported out of one of the committees in the next few months, I must tell you that I am going to take my bill and offer it on the floor to the first health bill that comes along and let the Senate decide what it wants to do.

In this case, I am not speaking, Orrin, of the fallout situation, only about the miners' situation. We must not delay on this one.

We have had some kind of bill or another before this Congress for over 3 years. We have had uranium miners, particularly the Indian people, and their doctors tell us about this situation, in the case of this Senator, for at least 5 years. I think we have to get on with this particular solution and solve it as soon as possible.

Senator SCHWEIKER. Thank you.

Senator METZENBAUM. Senator Hatch?

Senator HATCH. Thank you, Mr. Chairman. Pete, I want to congratulate you for your effort. I know that you have worked on this for a long time, and I think it is time that all of these matters be resolved.

Since your introduction of S. 1827, the Uranium Miners Act of 1978, you noted in testimony before this committee last June that you were preparing additional mechanisms in order to insure proper and adequate coverage for uranium miners so afflicted.

Could you comment on these?

Senator DOMENICI. You mean what is the compensation?

Senator HATCH. Yes. You said you were going to have additional mechanisms to provide this, actually to upgrade workmen's compensation.

Senator DOMENICI. My entire bill, Senator Hatch, is a totally 100 percent federally funded mechanism designed to fill the gaps in existing worker' compensation laws for this particular group of miners.

Senator HATCH. For workmen's compensation?

Senator DOMENICI. Workmen's compensation, but at a much higher level than any of the States in which the miners were working. Some collected under it, Senator Hatch. I do not want to deceive the committee, but those cases are rare.

For instance, Senator Hatch, among the medical profession, if you smoke, you will get different testimony as to whether or not it is cigarettes or working in the uranium mine that gave you the cancer. That is enough to get the statistics all out of focus and the worker who has cancer, who has had 14 years in the mine, will fall between the cracks in one State. We are going to eliminate that kind of thing in our bill.

The causation is going to be rather difficult. You do not have to work very long in the mine.

We think the statistics are on our side. If we are going to err, we are going to err on this side giving the benefit of the doubt to the miners and their heirs. There are about 30,000 people that were exposed during this period of time and we have given you the cursory facts on probably how many have contacted it. However, it might be two or three times that many by the time the case is finished.

Senator HATCH. I would add that the information furnished by Dr. Laverne Houston, who outlined his findings to you last year, a copy which you graciously provided to me and the committee, as I recall, Dr. Houston noted of the 14 cases of carcinoma of the lung which he reviewed, only 2 of them occurred in nonuranium miners.

Does Dr. Houston, to your knowledge, conclude that there is a definite cause and effect between the two and what are the general areas of his findings as a working physician which might be useful to us here today?

Senator DOMENICI. Senator Hatch, a Dr. Leon Gottlieb appeared before me in Grants. He concludes, as does Dr. Husen, that causation in a large majority of these cases is no longer subject to doubt. I do not remember at this point the details of his testimony, but we can make them available to your committees.

Senator HATCH. So your approach to workmen's compensation is to establish a more compensable level, while at the same time litigation might be brought under the Federal Tort Claims Act because you have medical causation established at least enough to take the case to the jury as a result of Dr. Laverne Houston's work?

Senator DOMENICI. Well, I think that is right, Senator Hatch.

Obviously if you do not have a workmen's compensation type statute right now, a miner that wants to sue in common law has a very difficult case.

One of the theses of your bill is to go ahead and find that a common law remedy does exist and to find the first causal connection—that is negligence—to find it as a matter of law. But you first have to find liability and then find negligence and then, of course, under the committee bill, the measure of damages apparently—I

read it quickly—it seems to me if they have died, it is the wrongful death remedy of the State where they died, whatever the wrongful death award may be, in some States $200,000, and in another $2 million. The wrongful death measurement in States varies. You know about that.

My legislation would say all those issues are gone, and that they will get benefits according to a set schedule. They will get a monthly compensation check for most of their lives. If they die young, certain heirs will get that for a number of years thereafter.

Senator HATCH. Thank you, Senator.

Senator METZENBAUM. Thank you, Senator Schweiker, Senator Hatch.

Senator Pell, you just arrived. Do you have any questions?

Senator PELL. No questions.

Senator METZENBAUM. Thank you very much, Senator Domenici, and your staff assistant.

We now have a panel of three witnesses, Rell Frederick, Lois Blood, and Harris Charley.

Mr. Frederick is from Marysvale, Utah; Mrs. Blood is from Cedar City, Utah; and Mr. Charley is from Beclabito, N. Mex.

I want to welcome the witnesses to this hearing and to tell you how pleased we are that you have seen fit to be with us.

It is my understanding that you do not have statements but that you are available to us for some questions.

Mrs. Blood, if you do not mind, I would like to start with you.

STATEMENTS OF RELL FREDERICK, MARYSVALE, UTAH; LOIS BLOOD, CEDAR CITY, UTAH; AND HARRIS CHARLEY, BECLABITO, N. MEX.; ACCOMPANIED BY JESSIE HARRISON, A WIDOW, AND MR. TOME, INTERPRETER, A PANEL

Senator METZENBAUM. How old are you, Mrs. Blood?

Mrs. BLOOD. I will be 67.

Senator METZENBAUM. Would you pull the microphone closer to you?

Would you answer that again, please?

Mrs. BLOOD. I will be 67 this month.

Senator METZENBAUM. Where do you live?

Mrs. BLOOD. Cedar City, Utah.

Senator METZENBAUM. How far is Cedar City from the Nevada test site?

Mrs. BLOOD. Approximately 160 miles.

Senator METZENBAUM. Would you bring the mike even a little closer, please? It is hard to hear you.

Mrs. BLOOD. Approximately 160 miles.

Senator METZENBAUM. I understand that a number of your relatives have died from cancer.

Can you tell us about these incidents?

Mrs. BLOOD. I will be glad to.

Between the years of 1951 and 1957, I lost four members of my family. In 1951, I lost my 15-year-old boy with leukemia, and in 1953, I lost a brother-in-law with cancer. In 1955, I lost my husband with cancer. In 1957, I lost my father with cancer, and in 1956, my present husband's wife died with cancer. They lived across the street from us at Cedar City.

Senator METZENBAUM. Did your older sister recently suffer from cancer?

Mrs. BLOOD. Just 3 weeks ago, I lost my older sister with cancer. She was the widow of the brother-in-law who had previously died from cancer.

Senator METZENBAUM. Where did your first husband work?

Mrs. BLOOD. My first husband?

Senator METZENBAUM. Yes.

Mrs. BLOOD. He worked as a car inspector for the Union Pacific Railroad out at the iron mines west of Cedar City.

Senator METZENBAUM. Did some of his colleagues expire from cancer as well?

Mrs. BLOOD. Yes. Within a very short time, five men who worked closely together, died with cancer. And within the last few years, four more workers have died from cancer. Of the total work force in that area, I think there were four men that survived.

Senator METZENBAUM. Do you have any recollection of what occurred at the time the tests took place? What did the local people do?

Mrs. BLOOD. The Atomic Energy Commission told us that there was nothing to fear and that they would like the people to get out and observe the test. Each time one of these were set off, we would go out in our backyard and watch the bright flashes and the mushroom cloud rise over Cedar City.

Senator METZENBAUM. This was sort of a show and the whole community would turn out to see it?

Mrs. BLOOD. Yes. There were many school teachers who would allow their classes to watch these mushroom clouds.

Senator METZENBAUM. And the Atomic Energy Commission encouraged this kind of community?

Mrs. BLOOD. Yes. Definitely. They told us that there was nothing to fear and that they just wanted everybody who could to watch.

Senator METZENBAUM. Now, on one occasion, did your present husband attempt to determine what the degree of radiation was in the area using a Geiger counter?

Mrs. BLOOD. Yes. As I stated before, he lived right across the street from where I lived. When they were setting the one particular bomb off, he and his friend had a Geiger counter which they used on the lawn at his home there. The radiation fallout was so great that the Geiger counter would not register all of it.

Senator METZENBAUM. Were there occasions when your husband came home late because the cars were stopped on the road?

Mrs. BLOOD. Yes, there were. On one particular day, I asked him why he was so late and he said the following:

They stopped all of the cars outside of town, west of Cedar, and they had to wash all of them because the fallout was so great on the cars. They would not let them into town before they had washed off all the fallout.

Senator METZENBAUM. Did they indicate who it was that had stopped the cars?

Mrs. BLOOD. Well, I really——

Senator METZENBAUM. Some Government official?

Mrs. BLOOD. Um-hum.

Senator METZENBAUM. I think you have now reported to us something in the area of 10 or 12 deaths involving members of your own

family or associates—no, I guess it would be about 15, because you said there were four more recent deaths at the railroad. So 15 deaths of cancer, some going from anywhere from the age of 15 to your sister, aged 83, but all resulting from cancer, is that correct?

Mrs. BLOOD. Yes.

Senator METZENBAUM. And when your son died, you had no health insurance, did you?

Mrs. BLOOD. No health insurance whatsoever. No medical insurance.

Senator METZENBAUM. What kind of bills did you incur as a result of this illness?

Mrs. BLOOD. Well, at that time, we had just started buying our home and had a large payment that we were making on our home.

Senator METZENBAUM. I am asking what kinds of bills you had.

Mrs. BLOOD. My husband was not making too much on the railroad. I think when they first started out, they were making $2.39 an hour

Senator METZENBAUM. Well, what I am asking is, as a result of your son's illness and ultimate death, did you incur a large number of bills?

Mrs. BLOOD. Yes, we did. The medical expenses, the doctor and the hospital bills alone were between $6,000 and $7,000. There was also the burial expense.

Senator METZENBAUM. You had no insurance to cover it?

Mrs. BLOOD. No insurance whatever.

Senator METZENBAUM. And no Government agency has compensated you for any of that?

Mrs. BLOOD. No. At the time my husband was working on the railroad, he was making a very small wage. After he passed away, the annuity from the railroad paid me $100 a month annuity.

Senator METZENBAUM. How much?

Mrs. BLOOD. $100 a month. That was for myself and three small children.

Senator METZENBAUM. Now that the people of your community have been informed as to the deaths that have occurred and the causal relationship, what is the attitude to the people of your community in connection with this subject?

Mrs. BLOOD. Pardon me?

Senator METZENBAUM. What is the attitude of the members of your community now that the facts are better known as to the incidence of cancer and causal relationship to the atomic testing? What is the attitude of the Government's failure to tell the people the truth and the Government encouraging witnessing of the atomic testing, a sort of a community affair. What is the attitude of the people now and towards their Government, toward the entire situation?

Mrs. BLOOD. I really think that they have been led to believe that there was no danger in that. Speaking for myself and the others, I think they feel that the Government should certainly compensate them. It was not only the loss of lives, of humans, but the losses that people suffered through their stock and their shepherds down there.

This one particular family, lost 250,000 ewes and lambs at the time this was going on out there.

Senator METZENBAUM. 250,000 ewes and lambs from one family?

Mrs. BLOOD. From one herd, yes.

Senator METZENBAUM. When your husband passed away, did you have health insurance?

Mrs. BLOOD. No, we did not. The railroad insured the employee, but not the family.

Senator METZENBAUM. How did you support yourself at that time?

Mrs. BLOOD. At that time, after my son died, I got a job and was working at the school lunch and making very small wages. I had that along with the $100 a month from the railroad.

Senator METZENBAUM. And after your husband died,

Mrs. BLOOD. I continued working.

Senator METZENBAUM. How much were you making at that time, do you remember, Mrs. Blood?

Mrs. BLOOD. I was making about $2.29 an hour.

Senator METZENBAUM. An hour?

Mrs. BLOOD. Yes.

Senator METZENBAUM. Do you think the Government owes you compensation for the losses that you suffered as well as the pain and suffering?

Mrs. BLOOD. I feel that they do. I certainly feel that they do. I think that if they would go ahead and compensate the people rather than take it into court would be the best way to do it.

Senator METZENBAUM. Do you think that reflects the view of the community generally?

Mrs. BLOOD. I am sure it does.

Senator METZENBAUM. Thank you, Mrs. Blood.

Mr. Frederick, how old are you?

Mr. FREDERICK. I am 47.

Senator METZENBAUM. I understand you used to work at the Marysvale uranium mine in 1950.

How long did you work there?

Mr. FREDERICK. I worked off and on in the uranium mines in Marysvale from August of 1950 until February of 1965.

Senator METZENBAUM. What were the conditions like in the mine while you were working there?

Mr. FREDERICK. The conditions in the mine were similar to any other hardrock underground mine. There is a certain hazard to working in the mines which all miners recognize, and this mine was no better or no worse as far as the underground mining conditions were for normal health and safety problems.

Senator METZENBAUM. How big a town is Marysvale, Utah, where you lived?

Mr. FREDERICK. I do not know the size of the town. The population of Piute County in 1970 was 1,164 people.

Senator METZENBAUM. How many?

Mr. FREDERICK. The county population was 1,164 people.

Senator METZENBAUM. How many of those people would you say are miners?

Mr. FREDERICK. I have notes showing that 110 people worked in the uranium mines.

Senator METZENBAUM. How many miners have died of lung cancer, to your knowledge?

Mr. FREDERICK. According to my notes, I know of 39 men who have died of lung cancer.

Senator METZENBAUM. Thirty-nine out of 114 employees?

Mr. FREDERICK. 110 people that I know of.

Senator METZENBAUM. And your own personal condition?

Mr. FREDERICK. I have had lung cancer problems.

Senator METZENBAUM. Did you receive any warnings in this mine that you might be exposed to lung cancer or problems from uranium? Were there any warnings at all given by the employer or by the Government?

Mr. FREDERICK. Speaking for myself, I was there most of the time the mine operated. I went to work as a Federal metal and nonmetal mine inspector in 1971, and I was not aware of the radiation hazard.

Senator METZENBAUM. Was there a pamphlet at one time posted on the wall talking about the dangers from uranium, from working in the mine with uranium?

Mr. FREDERICK. Since I had my problem, I have spoken with the bookkeeper, Nadium Corp. Mine. He told me that around 1959, a pamphlet was sent to the mine and the pamphlet listed the dangers they had noted in South Africa in a uranium mine. It showed that the the men in this mine in South Africa would hemorrhage and die right in the mine from a period of 3 to 5 years after they were employed, or 3 to 15 years after they were employed.

Now, the bookkeeper there, Leon Haus, said he thought that that was something that we should know so he put a string around the book, and he said that he hooked it on a nail by the office door. I guess the book had been there a couple of days, and the superintendent of the mine looked at the book, leafed through it, and saw what it was, and told him to get that book down. He said that there was no need scaring the miners with that kind of information.

Senator METZENBAUM. So that there was some notice, he put it up, the superintendent came along and told him to get it down a couple of days after he put it up. But that was the only time that notice was put up in the mine concerning the dangers of the mine, is that correct?

Mr. FREDERICK. That is the only time that I know of.

Senator METZENBAUM. Now, you worked in a separate area in the mine, is that correct?

Mr. FREDERICK. I worked in several areas in the mine, an underground mine in the type that we have there, which is somewhat unique to the other uranium mines in the United States. It is a fissure type ore body, and the ore is deposited in vertical fissures. So, on each level, these vertical fissures are broken up into segments called stopes. Most of them are about 100 feet long and from 8 to 30 feet wide, and they have a vertical distance when they are mined of about 100 feet. And one particular stope that I worked in was a rather high grade stope and a big producer, because of the extra width. It was a little more vertical in height, being 113 feet high, and because it was an extra heavy money maker for the company, they gave me the dubious honor of naming the stope for me. It is Rell's Stope, listed on the maps as that. It is only one of

probably three stopes in the mine that received a man's name rather than a number.

But, in that particular stope, there were 15 men that had reason to be associated with it for timbering purposes, tramping the ore, loading the blast holes, drilling the blast holes, and other jobs. Out of the 15 men that worked in that stope, there were only two men that have not yet been affected by lung cancer.

Senator METZENBAUM. Out of 15 men working on that stope, 13 have been affected by cancer, only 2 have not been, is that correct?

Mr. FREDERICK. That is correct.

Senator METZENBAUM. Mr. Frederick, where do you work now?

Mr. FREDERICK. I work in a lead-silver mine in Marysvale.

Senator METZENBAUM. Are you married?

Mr. FREDERICK. Yes.

Senator METZENBAUM. Do you have children?

Mr. FREDERICK. Yes; we have three children.

Senator METZENBAUM. How old are they? Approximation will do.

Mr. FREDERICK. One girl 28, one girl 24, and one girl 18.

Senator METZENBAUM. And what prospects do you see for your family in the near future?

Mr. FREDERICK. I had to use all the money that we have saved over the years to pay for the operation, the removal of my lung. If I have to go back for treatment, I will have to borrow money, and therefore, leave my wife in debt.

Senator METZENBAUM. Do you have any health insurance?

Mr. FREDERICK. None.

Senator METZENBAUM. About how much would you say you spent on medical bills so far?

Mr. FREDERICK. It cost me about $10,000 in actual medical expenses.

Senator METZENBAUM. Thank you, Mr. Frederick.

Mr. FREDERICK. There is one more thing I would like to say.

Senator METZENBAUM. Please do.

Mr. FREDERICK. I filed with the Utah State insurance fund for compensation and, as I said, I worked there for roughly 15 years, and they denied my claim.

Senator METZENBAUM. They denied your claim?

Mr. FREDERICK. They denied my claim.

Senator METZENBAUM. Have you received any money at all as compensation?

Mr. FREDERICK. None.

Senator METZENBAUM. From the Government, employer, anyone in connection with your lung cancer?

Mr. FREDERICK. No.

Senator METZENBAUM. The answer is "No"? Did you say no?

Mr. FREDERICK. No.

Senator METZENBAUM. Thank you very much, Mr. Frederick.

Mr. Harris Charley, we are happy to have you with us here today, sir.

I understand you have an interpreter with you. Mr. Tome, do you want to bring the microphone close to you so that you can be heard if Mr. Charley cannot answer himself?

Mr. TOME. I would like to introduce the people that I have with me here, including Mr. Charley.

Senator METZENBAUM. Would you speak a little more loudly, please?

Mr. TOME. I would like to introduce the people here.

We are members of the Navajo Indians from Arizona and New Mexico. We are here to testify.

To my right, Mr. Charley. To my left, Mrs. Harrison. She may have some information if there is time permitted.

Senator METZENBAUM. What tribe are you members of?

Mr. TOME. We are members of the Navajo tribe.

Senator METZENBAUM. I will ask Mr. Charley the questions and you are at liberty to answer for him if he is not in a position to do so.

Mr. Charley, how old are you?

Mr. CHARLEY. Fifty-nine.

Senator METZENBAUM. Are you married and do you have a family?

Mr. CHARLEY. Yes.

Senator METZENBAUM. When and for how long did you work in the uranium mines?

Mr. CHARLEY. Fifteen years.

Senator METZENBAUM. And tell me about your family, how many members are there?

Mr. CHARLEY. I have 21 plus wife.

Senator METZENBAUM. How many?

Mr. CHARLEY. Twenty-one plus wife, grandchildren, 6 boys, 3 girls, plus wife, makes 21.

Senator METZENBAUM. Six boys, three girls, wife plus the balance are grandchildren, is that it?

Mr. CHARLEY. Yes; 11 grandchildren.

Senator METZENBAUM. How long did you work in the uranium mines, Mr. Charley?

Mr. CHARLEY. Fifteen years.

Senator METZENBAUM. You stopped, as I understand, in 1964.

Mr. CHARLEY. Yes.

Senator METZENBAUM. Why did you stop?

Mr. CHARLEY. Because I have been having lung disease since——

Senator METZENBAUM. You had what?

Mr. CHARLEY. Lung disease.

Senator METZENBAUM. Do you know what kind of lung disease you have? In other words, is it lung cancer or a different kind?

Mr. CHARLEY. No, it is not a cancer.

Senator METZENBAUM. What were the conditions in the mines when you worked there, Mr. Charley?

Mr. CHARLEY. The mine condition was very poor from the beginning, since way back in 1940. That is the first time I started in the mine.

These mines was very poor and some of these places they were very rotten inside. See, these were caving in. That is mostly working these kinds of mines from the beginning.

Senator METZENBAUM. Were you ever given any health warnings or safety warnings about the mines?

Mr. CHARLEY. No.

Senator METZENBAUM. Was the subject of the condition of the mine ever discussed with the employer?

Mr. CHARLEY. No, never.

Senator METZENBAUM. What is the health condition of your friends and co-workers who worked with you in the mine?

Mr. CHARLEY [through interpreter]. There was no ventilation in the mine, and this caused a great hazard to the health of the other miners, including myself. Many of the miners do have the lung cancer.

Senator METZENBAUM. Now, was there some blasting done in the mines?

Mr. CHARLEY. Yes.

Senator METZENBAUM. Was there adequate ventilation to get the dust out after the dynamite blast?

Mr. CHARLEY. No; there was nothing, no kind of air. They just sent us in there; they did not care how dusty and how smoky it was. We had to change this by hand. So that is where we get all the problem.

Senator METZENBAUM. What about safety masks, did you wear those?

Mr. CHARLEY. No.

Senator METZENBAUM. Did they furnish them to you?

Mr. CHARLEY. No; they told us they was going to give us safety masks or a glass or something, but they never did.

Senator METZENBAUM. Do you know of people you worked with, how many have contracted lung cancer and how many have expired as a result of that, if you know?

Mr. CHARLEY. I know about 22 people with lung cancer today, and about 10 or 9 passed away several years ago.

Senator METZENBAUM. How many miners were there altogether?

Mr. CHARLEY. That is about it. See, I am from a very small community.

Senator METZENBAUM. Beclabito. You mean 22 is all the people that worked in the mine, from is a community of about 1,000? How many of the 1,000 in the community worked in the mines?

Mr. CHARLEY. Oh, around about, I would say, 35.

Senator METZENBAUM. Of the 35, how many did you say had contracted lung cancer, about 22?

Mr. CHARLEY. Twenty-two.

Senator METZENBAUM. Now, did the mine inspectors ever come down into the mines?

Mr. CHARLEY. Yes.

Senator METZENBAUM. What happened before they came or when they came?

Mr. CHARLEY. Well, our foreman knows that an inspector will come a day or two so they make us clean so much——

Senator METZENBAUM. They make you what?

Mr. CHARLEY. Clean it up where the miner will inspect, so that mine inspector will come around and see what we clean.

Let us take a little part right there. Just as soon as he took off, he will chase us back in the corner again.

Senator METZENBAUM. You shine up certain areas when the mine inspector is coming, is that what you are saying?

Mr. CHARLEY. Yes.

Mr. TOME. What he is saying is that when the foreman knows when the inspector is coming, they prepare the mine so that it

looks safe. Once he leaves, they go back into the mine again just like this mine which has been unsafe.

Senator METZENBAUM. Now, Mr. Charley, you have not worked since 1964, is that correct?

Mr. CHARLEY. Yes.

Senator METZENBAUM. How do you live?

Mr. CHARLEY. What?

Senator METZENBAUM. How do you live? What do you have for income?

Mr. CHARLEY. I have a little livestock.

Senator METZENBAUM. A little what?

Mr. CHARLEY. Livestock.

Senator METZENBAUM. How about your children? Have you been able to provide them with an education, clothing? You have 9 children, 11 grandchildren, what about the 9 children?

Mr. CHARLEY. The only way I make a living right now, is through social security. I get about $300 a month. That is all I get.

Senator METZENBAUM. How about your health condition at the present time?

Mr. CHARLEY. Well, my health condition, is very bad right now. I cannot even walk about quarter of a mile.

Senator METZENBAUM. Do you sleep well at night?

Mr. CHARLEY. Huh?

Senator METZENBAUM. Do you sleep well at night?

Mr. CHARLEY. No; I had a hard time last night. I walked almost a quarter of a mile last night. Harry knows about last night, how I slept with him.

Senator METZENBAUM. Mr. Tome, was there something that you wanted to add about Mrs. Harrison's husband?

Mr. TOME. Yes, Senator, she is a widow. She had a terrible experience with the child that she lost. Could you allow her to explain what terrible hardship she went through because of the passing away of her husband?

Senator METZENBAUM. He worked in the uranium mine?

Mr. TOME. He worked in the uranium mine.

Senator METZENBAUM. What did he die of?

Mr. TOME. He died of lung cancer.

Senator METZENBAUM. I would be glad to hear from her.

Mrs. HARRISON. I appreciate your giving me the time. My name is Mrs. Jessie Harrison. I am a widow of Phillip Harrison, Sr., and I would like to explain my situation. I have three girls and three boys. I want to say something that makes it worth it to come to Washington, so far away from my home. So I speak for myself and my people.

I am saying here, I am a widow and it is hard for me. This is a terrible situation. It is so real and true. Yet the kind of help that we have needed has been delayed to the victims' families——

Senator METZENBAUM. Mrs. Harrison, could you tell us what happened to your family, to your husband?

Mrs. HARRISON. Well, my husband died about 9 years and 4 months now.

Senator METZENBAUM. And from what, and under what conditions?

Mrs. HARRISON. He was working in the mine about 17 years.

Senator METZENBAUM. What happened to him?

Mrs. HARRISON. He died from cancer, lung cancer. The doctor told me it is from uranium radiation.

Senator METZENBAUM. Did the Government or any employer pay you anything after he died?

Mrs. HARRISON. No.

Senator METZENBAUM. Did you bring up the family?

Mrs. HARRISON. What?

Senator METZENBAUM. Did you bring up the family?

Mrs. HARRISON. Yes.

Senator METZENBAUM. How many members of your family are there? How many children?

Mrs. HARRISON. Six.

Senator METZENBAUM. How have you been able to bring them up? What did you live on?

Mrs. HARRISON. Well, it has been very hard for me. I tried to take care of them without anything when my husband died. To start, it is terribly hard to raise the kids. They go out on their own to get small jobs. One works; the other goes back to school; and I still have three in school now.

Senator METZENBAUM. Do you work?

Mrs. HARRISON. I have a job, small trading post over at the reservation.

Senator METZENBAUM. What community do you live in? Do you live in New Mexico?

Mrs. HARRISON. Red Valley, Ariz., west of Shiprock.

[The prepared statement of Mrs. Harrison follows:]

STATEMENTS OF MY TESTIMONY
(BY Mrs. Jessie Harrison)

Thank You. It is a great honor to testify before you this day.

Yes, I AM A WIDOW LEFT WITH SIX CHILDREN TO SUPPORT. IN JANUARY OF 1971, MY HUSBAND DIED OF URANIUM RADIATION CANCER AFTER WORKING IN THE MINES FOR SEVENTEEN YEARS. I AND MY CHILDREN ARE STILL SUFFERING GREATLY BECAUSE OF HIS DEATH. I AM HERE TO SPEAK FOR MY FAMILY AND FOR OTHERS.

THERE ARE OTHER NAVAJO FAMILIES THAT SUFFERS THE SAME WAY. THE FATHERS OF THOSE ALSO DIED WHILE THEY WERE MIDDLE-AGED, STRONG, AND HEALTHY, WORKING HARD TO RAISE THEIR FAMILIES. AND THEN THERE ARE OTHER EX-MINERS NOW LIVING BUT SUFFERING THE RADIATION CANCER. SINCE SUCH CANCER CANNOT BE HEAL, THEY ARE BUT WALKING SKELETONS. THEY ARE ON DEATH-ROW LIKE CONDEMNED PRISONERS OF WAR.

I BELIEVE RESPONSIBLE PEOPLE DEFINITELY OWE US VICTIMS SPECIAL COMPENSATION AND REIMBURSEMENTS FOR THE FOLLOWING REASONS -:

1. WE WERE NOT TOLD THAT URANIUM MINING IS VERY DANGEROUS TO HEALTH IN THE WAY OF CANCER - ALTHOUGH THIS WAS KNOWN BY THE RESPONSIBLE PARTIES;
2. THESE DEATHS AND HARDSHIP COULD HAVE BEEN PREVENTED IF THEY HAD NOT BEEN NEGLIGENT ABOUT THE HEALTHS OF THE MINERS AND THEIR FAMILIES.
3. A LOST FATHER DAMAGES THE FUTURE OF THE ENTIRE FAMILY. CHILDREN REALLY HAVE HARD TIMES IN EVERY WAY. CONSIDERATION OF BENEFIT MUST INCLUDE THE WHOLE FAMILY.

THIS TERRIBLE SITUATION IS SO REAL AND TRUE, YET THE KIND OF HELP WE NEED IS EVEN BEING DELAYED. SUCH DELAY ADDS MISERIES TO THE VICTIM'S FAMILIES. THEREFORE, MY DEAR LEADERS, I EARNESTLY PLEAD WITH YOU TO PROCESS OUR APPEAL FOR HELPS WITHOUT ANY MORE UNDUE DELAY. MY FAMILY AND MY FELLOW VICTIMS ARE IN GREAT NEED NOW!

THANK YOU VERY MUCH.

(Mrs.) Jessie Harrison, Widow.

Senator METZENBAUM. Senator Schweiker, do you have any questions?

Senator SCHWEIKER. Mr. Chairman, we have a vote at 11 o'clock, and in view of the work that Senator Hatch has done in this area and the fact that these people are from his part of the country, I will yield my time to him.

Senator HATCH. I thank the distinguished minority leader and I also want to thank our friend from Ohio, Senator Metzenbaum, because I think he has done an excellent job of highlighting important areas of controversy. I want to emphasize a couple of things today so that we all realize what a difficult thing it is here today.

You represent many people in southern Utah who have suffered a great deal. You have been an excellent representative today in talking about the problems we have had down in southern Utah. You mentioned that your son died of cancer at the age of 15.

Did he have any difficulties specifically before he died of cancer?

Mrs. BLOOD. No, he did not.

Senator HATCH. Was he a robust young man?

Mrs. BLOOD. He was not too robust. He was quite a tall slender boy.

Senator HATCH. But he was healthy?

Mrs. BLOOD. He loved athletics. He loved to play ball.

Senator HATCH. Had you had a history of cancer in your family before this happened?

Mrs. BLOOD. No.

Senator HATCH. Your husband died of cancer. Your first husband?

Mrs. BLOOD. Yes.

Senator HATCH. I understand that your brother died of stomach cancer in 1958 at the age of 57; your present husband's first wife and a lot of others.

Did the Federal Government give you any warning concerning the atmospheric tests that were conducted down in Nevada?

Mrs. BLOOD. Absolutely none.

Senator HATCH. Did they ever mention anything to you? Did they ever mention that it was all right to be outside during those atmospheric tests?

Mrs. BLOOD. As I stated before, they figured that we should not feel any dangers from watching these bombs and the mushroom clouds come over the city.

Senator HATCH. I take it you feel pretty misled by the Federal Government with the result to losses that you have suffered?

Mrs. BLOOD. I certainly do.

Senator HATCH. Do you feel that the Federal Government owes compensation to all of these victims, not only to yourself but to others that have suffered?

Mrs. BLOOD. I feel that they do. It was not only through the loss of loved ones, but there are lots of families that are still paying their medical expenses and burial expenses.

Senator HATCH. And you have had plenty of those because you did not have insurance?

Mrs. BLOOD. Yes, I have.

Senator HATCH. For a long period of time you had to work and you had maybe only $103 a month to support yourself and three remaining children?

Mrs. BLOOD. Yes. At the time my husband died my older son was in the Navy, and my oldest daughter was married. I was left with three small girls at home.

Senator HATCH. When your husband was alive, did you get along pretty well financially? Did you have basically a good life and things were going along all right?

Mrs. BLOOD. As long as you did not want to go buy a lot of extra things and do a lot of extra things. We managed on what small wages he made.

Senator HATCH. But you got along a lot better with him alive than since he died?

Mrs. BLOOD. Definitely.

Senator HATCH. Mrs. Blood, you remember, as I recall, the Government telling everyone that there were no health problems associated with the fallout and that people were going up in the hills with lounge chairs in order to watch the detonation as if it were the 4th of July?

Mrs. BLOOD. That is right.

Senator HATCH. No warning from the Federal Government that there might be something possibly wrong there, is that right? No warning at all?

Mrs. BLOOD. No warning at all.

Senator HATCH. You actually saw the film, dust, radioactive dust on the railroad cars as they came into your community?

Mrs. BLOOD. We could see it plain from our back door. We would go on our lawn and stand and watch it as the mushroom cloud would come over.

Senator HATCH. I think it is disgusting what you have had to go through. I think it is pathetic that the Federal Government did not have the courage to warn you folks. If we had that minor consultation, we might have saved a lot of lives of people covered by our bill. I commend you for coming in today and giving your testimony and expressing yourself. I know it is not easy. I am grateful that you came.

Mrs. BLOOD. I would like to say one thing, that I certainly do not feel that the deaths of my family members were only a small price to pay. I think that there have been many people around southern Utah that have sacrificed and sacrificed heavily.

Senator HATCH. Mr. Frederick, they call you Rell?

Mr. FREDERICK. Yes.

Senator HATCH. Rell, one of the things that I have been concerned about in your situation is that you filed with the State compensation insurance program and they turned you down.

Mr. FREDERICK. That is correct.

Senator HATCH. Did they give you any reason for turning you down at that time?

Mr. FREDERICK. No. I thought I had the letter here but I do not. I have a letter back in the State insurance fund to the State Industrial Commission of Utah, saying that this claim is denied at this time, and that is all it says.

Senator HATCH. Will you find that letter and send it to me or have your counsel send it to me?

Mr. FREDERICK. I can, yes.

Senator HATCH. I would appreciate it.

[The information referred to follows:]

THE STATE OF UTAH
INDUSTRIAL COMMISSION
AND
UTAH LABOR RELATIONS BOARD
160 EAST 300 SOUTH
SALT LAKE CITY, UTAH 84111

SCOTT M. MATHESON
GOVERNOR

COMMISSION
CARLYLE F. [illegible]
CHAIRMAN
STEPHEN M. HADLEY
MILTON E. HAATHOUT

July 28, 1980

Orrin G. Hatch
United States Senator
411 Russell Senate Office Building
Washington, D. C. 20510

Re: Rell W. Frederick
Inj: Occupational Disease Claim
Emp: Marysvale Mining Co.

Dear Senator Hatch:

This letter will confirm a prior conversation between your secretary and our administrative assistant regarding your request to receive information concerning the results of a hearing on Mr. Rell W. Frederick's lung cancer claim.

Please be advised that the case is now about ready for submission to a medical panel for an evaluation of the medical aspects of the case. We will endeavor to furnish you the final results of our hearing process.

BY DIRECTION:

INDUSTRIAL COMMISSION OF UTAH

By [signature]
Stephen M. Hadley
Commissioner

SMH/mm

cc: Rell W. Frederick, P. O. Box 182, Marysvale, UT 84750

STATE INSURANCE FUND • [illegible] • SALT LAKE CITY, UTAH 84111

[illegible] 2, 1980

[illegible] Boyd
Workmen's Compensation Div.
Industrial Commission of Utah
160 East Fifth South
Salt Lake City, Utah 84111

Re: Rell W. Frederick
Occupational Disease Claim
File #80-6823 (S)
Empl: Marysvale Mining Co.

Dear Mrs. Boyd:

We are in receipt of your letter together with a copy of the Occupational Disease Claim filed with your department by the above.

The State Insurance Fund was the workmen's compensation and occupational disease carrier for the above company and in connection with this claim must at this time deny any liability for Mr. Frederick's lung condition.

We believe this should be noticed for hearing in order to set a record for a referral to an occupational disease panel for a determination of Mr. Frederick's health problems and any industrial connection they may have.

The State Insurance Fund would be represented by the firm of Black & Moore.

Very truly yours,

STATE INSURANCE FUND

Joe Kirkham
Service Counselor

JK/jf

cc: Rell W. Frederick
Marysvale Mining Co., Inc.

Senator HATCH. When did the Utah State insurance fund deny your request?

Mr. FREDERICK. I got the letter back approximately 3 weeks after I filed.

Senator HATCH. That was how long ago, do you remember?

Mr. FREDERICK. That was this year, February. I filed on February 22, the day I had my lung removed.

Senator HATCH. I think you should refile. I am going to check with the Governor about this.

Mr. FREDERICK. I was advised to get an attorney and I have done that.

Senator HATCH. You are planning on refiling?

Mr. FREDERICK. Yes.

Senator HATCH. All right.

To your knowledge, did the 15 fellow workers that you described earlier in your testimony, the 13 of them who contracted lung cancer, did they also apply to the insurance fund and were any of them given any compensation or were they all denied?

Mr. FREDERICK. The men I have talked to and the widows of the men I have talked to have all filed and they have all been denied.

Senator HATCH. Have they all collected counsel and advice to get counsel themselves?

Mr. FREDERICK. Some of them have and some of them merely dropped it.

Senator HATCH. OK.

You have had a lung cancer problem and, as far as you know, you have got your fingers crossed that everything is all right now?

Mr. FREDERICK. That is correct.

Senator HATCH. But you are not sure that it is?

Mr. FREDERICK. The doctor would not guarantee anything.

Senator HATCH. Well, let me say this to you. Senator Domenici—we cover your problem in our bill, Senator Domenici and the rest of us cover your problem. I will support him on the floor of the Senate if he tried to promote this bill this year, and if we are unsuccessful in bringing up our own bill this year. I just want you to know that we will do everything that we can.

Mr. Charley, we appreciated having your testimony here today. We appreciate you coming in and also you, Mrs. Harrison. Thank you all for coming.

Mr. CHARLEY. I thank you for your help, Senator Domenici and all the Senators, and we appreciate coming to Washington. This is my first trip here.

Senator HATCH. Thank you, and we are happy that you could come to Washington, and testify before this subcommittee.

Senator SCHWEIKER [presiding]. We want to thank the panel for coming before the subcommittee. I know, as Senator Hatch stated, it is not easy for us to hear all the testimony, and it is difficult for you to testify about such personal tragedies. We see here a deeply disappointing failure in our Federal Government's truthfulness, a failure to deal honestly with our own people.

We thank you all for being here this morning.

Our next witness is Mr. William G. Schaffer, special litigation counsel for the Civil Division, Department of Justice.

We will call Mr. Schaffer to come up now, and ask him to wait for us to reconvene after the vote.

Senator METZENBAUM [presiding]. Mr. Schaffer, we expect to hear from you, but let me first review with you some background on this issue. In May of 1978, the White House directed the Secretary of HEW to form a program covering, among other things, care and benefits for persons adversely affected by radiation exposure. That was 2 years ago.

In June 1979, a little bit more than a year later, an interagency task force produced a report setting forth options for compensation. As a result of this report, on July 20, 1979, the President directed that an interagency task force be established to study and recommend alternatives for compensation of persons who may have developed radiation-related illness. That is what the first task force was supposed to do.

Now, we have a second task force to study the first task force. In any event, the second task force was supposed to have submitted a report by October 1. That task force did not produce its report until February 1, 1980. On all the difficult issues, that task force made no recommendations. It did recommend that an attempt be made to develop legislation which would provide compensation, a compensation program for the resolution of the claims of the downwind residents.

Now, 4 months after receiving the report of the second task force, and over 2 years after the President directed the process to begin, the administration's position today, as I understand it, is that deciding what to do is complex and perplexing.

Mr. Schaffer, I have to say that these people have suffered over 20 years. When a lady comes forth and talks about 15 people, 10 in her family and 5 who are known to her, who have died of cancer, others are talking about living on a bare pittance to bring up their family.

My question is, Does the Government need to be so unresponsive? Can the Government not respond more promptly with a specific program rather than with telling the people that the problem is complex and perplexing?

It so happens that the cloture vote has been called for. I would appreciate your giving some thought on that. I will be back just as promptly as I can, and I hope at that time you will be able to respond.

Thank you.

[Short recess.]

Senator METZENBAUM. Mr. Schaffer, I am sorry I had to leave but I had no control over that situation.

Do you want to proceed, both with your statement as well as your response to my inquiry?

STATEMENT OF WILLIAM G. SCHAFFER, SPECIAL LITIGATION COUNSEL, CIVIL DIVISION, DEPARTMENT OF JUSTICE

Mr. SCHAFFER. Yes, Senator. Would you like me to read my statement first?

Senator METZENBAUM. Whatever is your convenience.

Is it a lengthy statement?

Mr. SCHAFFER. No. It is fairly short and it sets forth our position on the downwind individuals.

Senator METZENBAUM. All right. Go ahead.

Mr. SCHAFFER. Mr. Chairman, members of the subcommittee, I am pleased to appear before you today to express the administration's views to S. 1865, the Radiation Exposure Compensation Act of 1979.

As you have previously recognized, two interagency task forces have recently completed extensive studies entitled "Health Effects of Ionizing Radiation," and "Compensation for Radiation-Related Illnesses," both of which relate to the issues which S. 1865 addresses.

The task force on compensation for radiation-related illnesses submitted a report to the White House on February 1, 1980, concerning the health effect of exposure to radioactive fallout on persons who resided downwind from the Nevada test site. Using conservative assumptions, and allowing a relatively wide margin for error in calculating probable doses, the task force concluded that the number of cancers, among the 172,000 downwind residents, which might possibly have been related to exposure to radioactive fallout, was on the order of 9 to 96, of which 3 to 32 would be fatal.

As this subcommittee is well aware, cancer is a disease which is terrifyingly prevalent in our society. National statistics indicate that one out of every four Americans will contact some form of cancer during his lifetime, and one out of every six Americans will die from the disease. Although the Utah cancer statistics are somewhat lower than the national average, application of those statistics to the downwind population would nevertheless yield in excess of 35,000 cases, of which more than 20,000 would be fatal.

The disparity between the relatively small number of possibly radiation-related cancers and those cancers which would be expected to occur naturally, together with the fact that radiation-related cancer is clinically indistinguishable from naturally occurring cancer, renders it exceedingly difficult to design a program which would fairly and equitably provide compensation to those whose injuries were most probably radiation related.

Although we support the effort to identify and compensate those who may have suffered as a result of the test program, we believe that the approach provided by S. 1865 is neither an appropriate nor an equitable method of doing so.

First, S. 1865 is extremely overbroad in application. Simply speaking, the bill would provide damages to anyone who resided within the specified geographical area during the period of the testing and who subsequently contracted one of a number of forms of cancer. Such an approach can be considered fair only if one assumes that little or no cancer would have occurred absent the testing. The facts, however, are to the contrary. As mentioned earlier, the task force projected the possible range of radiation induced cancers to be in the range of 9 to 96 additional cancers, in a population which is expected to have more than 35,000 naturally occurring cancers.

In an effort to quantify the problem further, the task force calculated the number of excess cases of the four types of cancer considered most sensitive to radiation likely to occur among the

approximately 6,000 individuals who were potentially exposed to more than 6 rem of radiation. The results, which appear on page 33 of the task force report, are instructive: For example, over a 25-year period, the expected natural incidence of leukemia in this group would be 11.1 cases. Using conservative assumptions; the expected increase from radiation exposure was calculated to be 0.84 cases. The expected incidence of breast cancer would be 51.4 cases; the increase attributable to radiation exposure was calculated to be 1.46 additional cases. For lung cancer in males, the expected incidence was 28.4 cases; the increase attributable to radiation exposure was calculated to be 0.38 cases.

It must be stressed that these figures apply to that portion of the downwind population which received the largest exposures. Of 172,000 persons who resided in communities with recorded exposures, the vast majority, over 143,000, were potentially exposed to less than 1 rem.

As with any estimates which are based on assumptions, these figures are subject to debate. However, the basic conclusion derived from them is in accord with all of the statistical evidence which is presently available. Except for the childhood leukemia cases observed by Dr. Joseph Lyon, whose findings are the subject of some controversy in the scientific community, the statistics of the Utah tumor registry, and Dr. Lyon himself would confirm this, reveal no statistically significant increase in the incidence of any form of cancer among the downwind population.

By providing compensation to all cancer victims in the designated area, the effect of S. 1865 is to legislatively create a special class of cancer victims who will receive a substantial monetary payment from the Federal Government. Based on the foregoing analysis, this is unwarranted by the facts and is thus unfair to the millions of individuals elsewhere in the Nation who are also afflicted with this dreaded disease.

Second, we believe that the type of compensation envisioned by S. 1865 is inappropriate and would place an enormous and unwarranted burden on the American taxpayer. S. 1865, in effect, presumes liability under the Federal Tort Claims Act and permits an eligible claimant to litigate the amount of his damages in the U.S. district court.

In a conventional torts case, a plaintiff is permitted to recover only after he has proved negligence or wrongdoing, and that his injuries were caused by the wrongful conduct. After these elements are proven, the law permits the injured party to recover money damages in an amount which theoretically will fully compensate the loss or injury suffered. Such damages traditionally include not only actual financial losses, such as medical expenses and lost earnings, but also the intangible aspects of the injury such as pain and suffering, loss of parental guidance, loss of companionship, et cetera. Since no amount of money can truly compenate for the loss of a loved one, or for the suffering endured through an illness such as cancer, damage awards in such cases tend to be very large, with awards in death cases commonly exceeding $1 million.

While this form of compensation may be warranted in the conventional tort situation, we believe it has no application in a situa-

tion where, as here, negligence or wrongdoing has not been established, and causation has not been and cannot be established.

Any program to provide compensation to the downwind residents, or any other group of individuals claiming injury from exposure to radiation, will inevitably compensate some whose cancer was not caused by radiation. It may well be that we will decide that such overcompensation is an acceptable method for our society to deal with radiation and no other technological hazards of the age in which we live. If we do so, however, it is vital that we understand what we are doing—that is, insuring against risks rather than compensating for wrongdoing—and that the nature and the amount of the compensation be based on a model which is appropriate to that task.

In conclusion, we support and, as Senator Metzenbaum pointed out earlier, we have been struggling with the effort to identify and compensate those people who may have been injured by exposure to radiation from the atmospheric weapons testing program. The task of doing so is extremely complex and perplexing. In all candor, we have not yet arrived at an acceptable solution. Our extensive analysis of the problem, however, permits us to state with confidence that the approach set forth in S. 1865 is neither warranted by the facts nor an appropriate manner of resolving the problem.

Mr. SCHAFFER. That concludes my prepared statement. If you want me to attempt to answer the question which was previously put, I will do so.

Senator METZENBAUM. I think it only fair that you be given the opportunity to do that.

Mr. SCHAFFER. It has taken a long time. I think in fairness—although I, too, would hope for more progress in the area—we have made significant strides.

For the first time since the testing concluded in 1962, for the first time, an administration has come forward and admitted that there was some adverse health effect. That may seem like a very simple and very obvious statement. But I can tell you from my experience in chairing the task force that it was not easy to develop. I should point out that the task force recommendations were unanimous. They represent the views of those representatives who served on it from the Department of Defense, the Department of Energy, Department of HEW, Veterans' Administration, and numerous other governmental organizations.

The task of achieving that consensus was not easy. There is a great deal of scientific debate on the health effects of ionizing radiation. The scientist are not in agreement, so it is not at all surprising that the lawyers and policymakers can't reach an agreement.

I was heartened to hear what Senator Hatch said in his opening remarks. I think that with the conclusion of our task force report, we have made some progress towards quantifying the problem and, at least suggesting, what a solution might look like.

Even the solution, which is proposed in the task force, however, is complicated. There are complex questions unresolved: scientific questions as to feasibility; many economic questions as to the cost of the program; and policy questions which ultimately would be for the President and for the Congress to focus upon concerning

whether we as a nation want to use this method to deal with our technological problems of which radiation is only one.

The testing was particularly dramatic. I think everybody in this room—I remember seeing it on television—I think most of us remember that time. It is a particularly dramatic form of technological hazard. The decisionmakers at the time felt that the testing program was in the national interests. It is easy to perhaps second guess that judgment; but those were the people from the President on down who were charged with making those decisions.

The problem of the individuals residing downwind is not that different—from Love Canal, from Three-Mile Island, and from many other problems——

Senator METZENBAUM. Isn't there a big difference in that here the Government reassured the people. Here the Government said, "Everything is safe." Here the Government almost, as one lady said, they practically encouraged them to come out and view the great show. That hasn't always been the case, and it seems to me that that is a major distinction.

Having said that, I think I am going back to vote again. I will come back, I do have questions. I know that Senator Hatch has questions, and—I guess that means that we have 7 minutes 30 seconds.

[A short recess was taken.]

Senator METZENBAUM. Let's try again, Mr. Schaffer.

Mr. SCHAFFER. I keep getting saved by the bell.

Senator METZENBAUM. Mr. Schaffer, the task force was made up of Government people, is that right?

Mr. SCHAFFER. Yes.

Senator METZENBAUM. And your position—you are special litigation counsel for the Department of Justice?

Mr. SCHAFFER. That is correct.

Senator METZENBAUM. And in that capacity, have you been involved in governmental positions in opposition to the award of compensation to cancer victims in this radiation area?

Mr. SCHAFFER. When I was chairman of the task force, I was Deputy Assistant Attorney General. I had supervisory responsibility for that kind of litigation. I also had settlement authority.

You are correct that the Department of Justice has often represented the Government in opposition to these claimants, but, we take seriously the statement that "the Department wins, when ever Justice prevails." We are not, blind to the legitimate needs of people who have been injured, and I am not uncomfortable with playing that role.

Senator METZENBAUM. Isn't perception of justice sometimes equally as important as the way scales themselves weigh? In this case, if you were a cancer victim, you had lost your husband and son, or beloved one, and were in court and the Government was on the opposite side of you, and then you found that your Government was going to do something: They were going to create a task force to examine the subject and decide what was fair. The man who had supervisory authority over the case in opposition to the awards wound up being the chairman. What would be your perception?

Mr. SCHAFFER. The reason that the White House directed the Justice Department to chair that task force was, I think, the per-

ception that the Justice Department, of all of the agencies represented, was the only one which did not have a institutional interest, and did not have an institutional bias. Since there has been implications——

Senator METZENBAUM. You are not answering my question. What would be your perception, if you were a cancer victim resulting from radiation, and the head of the Government agency opposing the award of compensation wound up being the chairman of a task force examining into the question of whether or not there should be compensation for radiation-related illnesses.

Wouldn't your perception be that I don't have a chance at all, the dice are loaded against me?

Mr. SCHAFFER. I think that it might be initially, but I think that if I had the opportunity to explain that role to the individuals, I could—I would hope that I could clarify that.

Senator METZENBAUM. How? How would you clarify the fact that you are the adversary in the courtroom and at the same time you are chairman of this so-called impartial commission that, as I see it, must have gone beyond the purview of your own responsibilities because the title is: "Compensation for Radiation Related Illnesses." And much of your testimony doesn't go to the question of compensation. Your testimony goes to the question of whether or not there was a cause, whether or not there is a basis to make a claim.

Now, I think that is very different than the whole question of how much compensation, which is what I would have thought the title of your task force was addressing itself to.

Mr. SCHAFFER. The real issue that was before the task force was: Is there a method by which we can fairly and equitably provide compensation for the downwind people? Is there a way to draw the line?

I think that everyone recognizes what the problem is, the cancer occurs naturally and it is indistinguishable. Our task was to answer: How can we fairly do it?

Our mission did not involve the amount of compensation, and the Justice Department really doesn't have a concern with the amount. That's a matter for Congress and for the President to decide.

Our concern was: Could we do it fairly? We were concerned and I so testified before Congressman Eckhardt last fall, that litigation had a lot of problems. It is there and we may well be stuck with that if nothing else comes up. We may not be able to come up with something that is preferable.

But I was concerned about litigation because indeed it is not inconceivable, that the Government would win the lawsuit. It is not inconsistent with the Justice Department's mission to say that litigation is inappropriate because we are going to win. That kind of statement is made around the Justice Department often; it is those times that we come to Congress, in support of special relief legislation.

The task force recognized that there were probably some people whose cancer was caused by the testing. We——

Senator METZENBAUM. But you didn't address yourself to the question of how much they should be paid or whether they should

be paid which was really the subject of your task force as I understood it. The task force was supposed to develop an options paper for Presidential decision.

Yet, the paper studiously—so obviously ignores the most damaging evidence against the Government. The report is so sanitized that readers would hardly guess we are talking about the human element, the children dying of leukemia, families that are ruined. None of that human side of the problem was included at all in the Presidential paper. I have to say to you that you may have something over the Justice Department about justice, but I am familiar with and you are familiar with hundreds of cases that the Justice Department has gone in—not only in this area, but many areas on purely technical grounds: Because somebody didn't have standing, because of any one of a dozen other technical bases.

So, I am not satisfied that the Justice Department always looks up at that motto on top of the entrance and says, "I am on my way to the courtroom and I want to live up to that motto."

I think the idea is: We've got to win. And as a consequence, you win in the courtroom. Now the Congress is trying to do something about compensating for the wrongs of Government and failing at least to share the facts with people. They appoint a "loaded deck" Commission. That's all it has to be is a loaded deck.

You say that it was difficult to get them all together. What's so difficult about it? They all work for the same Government. Were there any outsiders on the task force? Were there any scientists? Were there any physicians? Were there any people who didn't have their paycheck coming in from the Government?

The fact is, you come out with a unanimous recommendation but you do nothing at all about talking about the obligations of Government.

I am shocked and I must say to you, I don't think that you should have ever accepted the role of being chairman of that Commission. I think that you had a conflict of interest that was built in.

Mr. SCHAFFER. Senator, I think that we did state in the report that the Government should accept responsibility for these people. The President talked to the Governor of Utah, and I think we were all aware of the problem. It was—and I have to differ with you—it was fairly remarkable to get a unanimous agreement from the Government agencies represented, and they were mostly Government. There was some employees of private contractors, but they also did substantial Government business.

I think that it was remarkable that the first time in our history the Defense Department, the Department of Energy, the VA, HEW, everybody, especially the Department of Energy and the Defense Department as successors to the AEC and the people who were involved, said, "Yes. We probably did hurt some people."

Your question earlier about warnings and this sort of thing, that really goes, if I can draw a dichotomy, to the matter of whether we should do something. We assumed that our task was to answers the "can we" question. And we sort of said, "We assume that the 'should we' is a decision for the President. There is no need for us to document the historical facts."

And I did take some exception to your statement that no warnings were given. And I will address that if you want me to. But we assumed that regardless of the legalities, regardless of the liability, regardless of the wrongdoing, if we had done something and somebody got cancer as a result of it, then we viewed our mandate as asking: How can we find out who that person is? How can we equitably deal with this puzzle? That is what we were trying to do.

Senator METZENBAUM. Mr. Schaffer, in your testimony, you state that in the situation before us today, "Negligence or wrongdoing has not been established". Now, I tell you, I find that statement absolutely astounding on its face in view of everything that has come to light in the last year.

Let me tell you—cite to you an exchange at an earlier committee hearing. The April 19, 1979, hearing, Peter Lebassi—phonetic—former general counsel of HEW and a member of the first Presidential task force, responded as follows to a question by Senator Kennedy:

> Senator, the American people were not informed that the evidence that was gathered during the 1950's and 1960's or the uncertainties as to the health effects of radiation from these atmospheric nuclear tests. They simply were not informed of the uncertainties that we knew about at that time.

At that same hearing, the committee received as evidence propaganda material that had been prepared by the Atomic Energy Commission that stated in part:

> An unusual safety record has been set. No one within the Nevada test site has been injured as a result of the 31 test detonations. No one outside the test site in the nearby region of potential exposure has been hurt.

In light of this, in light of everything that we have learned, how can you say in your report that negligence and wrongdoing has not been established? What bothers me so much is that this is a Government report. I would understand it if it came from a private industry group, or if they hired some consultants.

But in view of the evidence, I just don't understand how your task force could have arrived at this conclusion and I also don't understand how the task force could have had an advocate on one side, an advocate in opposition as the chairman, that is so very disturbing. And don't forget, you are speaking for the administration. This is not just some outside group, this is the administration's position. There is no wrongdoing? How can you possibly say that?

Mr. SCHAFFER. Senator, maybe I'm too hung up on the legal idea of wrongdoing or negligence. I think——

Senator METZENBAUM. That was my point. You shouldn't have been chairman. You are too hung up on the legal aspects.

Mr. SCHAFFER. Maybe so. But I think if one examines the record, my statement can be supported. It is hard to examine the record. There are millions of pages of documents over about a 15-year period. Some of what we have seen to date has been compiled by journalist and by other people who were trying to make a specific point. I am not being critical, but when you go to tell a story, you can be selective about the documents you use.

I think that there were warnings; I think the true story is that we didn't know. I think the record reflects——

Senator METZENBAUM. Lebassi said there weren't.

Mr. SCHAFFER. I'm not sure that Lebassi saw all of the documents, and I am not sure exactly what he meant.

I am not opposed, and I don't think the administration is opposed, to compensation. So, I think we're kind of over the issue of whether we did something wrong, or didn't do something wrong. As long as we are willing to provide compensation, then it seems to me the issue of negligence is irrelevant. I don't believe that it is the intention of the drafters of the bill that it is a punitive type bill. I think, once you get to the point where you say, "Yes, we want to do something," then it doesn't really matter how negligent you were. All we are saying is, "We hurt somebody." It may have been——

Senator HATCH. Would the Senator yield for just one comment?

No, it is not a punitive bill, it is intended to be a just bill, not an actuarial account on the side of cutting out as many people as we can from fair compensation, but a reasonable approach since it is difficult to fully define. But the perimeters make certain that we don't ignore the fact that literally thousands of people were exposed and probably many of these people have died as a result of it.

I happen to have been in Salt Lake City when Peter Lebassi gave his testimony. I felt that his testimony was devastating to the Government's case. And I think that had you started from the position of looking at the testimony of the Government's own witness, including Mr. Knapp—phonetic—who testified, I think—plus the more than adequate testimony that there was a reasonable degree of medical certainty involved that these problems probably occurred from the atmospheric testing in the fifties and sixties, instead of approaching it from a "defense of the Government." I think you would have come up with a different conclusion.

Mr. SCHAFFER. I can only say that I don't think we did approach it in that manner. I think that we started with the premise that we were being asked how to compensate and assumed that we would compensate.

We were not being asked by the White House to say, "Should there be compensation? Did the Government do anything wrong?" I can make a case——

Senator METZENBAUM. I just want to ask, how do you advocate to compensate them? People are now suffering illnesses. The man in the back of the room has had one lung removed. He is having a difficult time. There is a lady who has lost much of her family. The Indian people have had great difficulty.

All you have told them so far is that it is a perplexing and complex problem.

Senator HATCH. Do you want absolute proof? Is that what you want?

Mr. SCHAFFER. No. Let me say that my prepared statement and what I have said so far relates to the downwind people. I think that as Senator Domenici pointed out, I think that the miners are in a different situation, and I will address that issue if you desire. The administration still opposes the treatment of miners in this bill and I can address the specific problems that we had with it.

Senator METZENBAUM. Do you support compensation for the mine workers?

Mr. SCHAFFER. I don't think that the administration has a formal position on that. I think that the miners should be compensated, but I think that since it is an occupational exposure, we should explore the traditional way of compensating occupational injuries before we——

Senator METZENBAUM. When will the administration have a position?

Mr. SCHAFFER. We have a position on this bill. I don't think they have formally given a position on Senator Domenici's bill, that is what I was saying.

Senator METZENBAUM. The question is: When will you have a position as to how we compensate victims. You said: "We are not opposed to compensating the downwind people." I gather that you are not opposed to compensating the mine workers. I would assume that you are not opposed to compensating the sheep ranchers.

Now, am I correct in those assumptions?

Mr. SCHAFFER. If I could just qualify them slightly.

I think the story that was told by the people up here, and other witnesses that testified to in other forums on behalf of the miners is a very eloquent and telling story.

It may well be that ultimately Congress is going to have to step in and foot the bill. I personally believe that this story is tragic and that these people—I think the statistical differences and the causation problems are very different for the miners. I personally believe those people should be entitled to compensation.

I think that, as with any occupational injury, the first approach to compensating those people should be to put responsibility on the owners and operators of the mines. We were the operators of the Nevada test site. There is no doubt about that. We were not the operator of the uranium mines and we did not, at that time, have any regulatory responsibility.

Second, I think that Senator Hatch's statement before was very important. If we can put responsibility for the miners on the owners of the mines, and these people have been turned down by their own State workman's compensation programs, these people ought to be talked to and perhaps those people ought to appear before this committee to find out whether it is just some bureaucrat who refused to recognize the claims, or whether indeed there was a problem.

And only then do I think the Federal Government should step in for the miners.

Senator METZENBAUM. Mr. Schaffer, I have to say to you in all honesty, there have been two task forces. You headed one, there was a predecessor. The problem has been going on for some time. Pete Domenici has talked about it for 5 years; Congress has been into it for 2 years.

Now, when is the administration going to have a position regarding what compensation, if any, should be paid to these people? You must be a realist. We are in an end of a term, we don't know what is going to happen in the future.

And the question remains: Is this administration going to address itself to this very difficult and very humane problem, or is it just going to appoint a third task force to wait another few

months? The last task force reported on February 1, isn't it time we had some answers?

Mr. SCHAFFER. The February 1 task force report did not address the question of the miners. I think the question of the miner—I think if we do——

Senator METZENBAUM. It addressed the downwind. When are you going to have a position on what compensation, if any, the downwind people should get? That was your job. You were Chairman of the Commission on Compensation. And all you have said it is a perplexing and very difficult problem. When are you going to have a position?

Mr. SCHAFFER. That is not all the task force said. The task force recommended a procedure by which you could isolate groups of people and provide compensation and made certain recommendations.

Now, the administration has not adopted those proposals, and are studying them. I share your frustration. I wish we could go faster. I thought that it could, and perhaps I am naive. They are studying the problem. It is not just sitting on someone's desk. Just yesterday I was asked to provide a memo about who should answer some additional questions that people have come up with.

And our proposal, if ultimately it goes anywhere, is going to have to come before Congress. And I suspect that there will be many debates about it. Whichever way we go, I don't think there will be unanimity about it.

Yes, the administration is committed. We would not have spent the time and effort that we have spent if we weren't. We are committed to compensating the people that we hurt. In order to not miss those people, we may support an approach which compensates more than the number.

But we don't think that you can take a blanket approach and compensate everybody who has lung cancer. We know that we did not cause all of that.

Senator METZENBAUM. Mr. Shaffer, I hear what you are saying. All I know is that Congress doesn't have that many more days to meet this year. You know there is a Republican Convention, Democratic Convention, an election.

These people aren't really concerned about those political events. They are concerned about the realities of their own lives.

Now, I am asking you, as chairman of this committee here in this bipartisan basis because I am sure that Senator Hatch, Senator Domenici, Senator Kennedy, and others would like an answer. And I am asking you to give us a firm position as to what the administration thinks the Congress should do with respect to the downwind people, the sheep herders and miners.

And I am asking you to give it to us either immediately before or immediately after the conclusion of this public hearing, which should give you adequate time. And I think that is not an unreasonable request.

I am not asking you to answer today something that you are not authorized to answer, but I think that gives you adequate time. I think that immediately before or immediately after the Republican Convention, if that is more convenient for you, the administration

ought to tell us what they think Congress should do vis a vis these people.

Mr. SCHAFFER. I will certainly convey that, Senator.

Senator HATCH. Mr. Schaffer, I have read your report and found it very interesting.

Let me say first, as 1865 is extremely broad in application. Before I begin on that, you are a supervising Department of Justice lawyer, is that correct?

Mr. SCHAFFER. That is correct.

Senator HATCH. And you are chief trial counsel in the cases that have been brought to pursue damages with regard to the radioactive affects of the 1950's and 1960's downwind tests.

Mr. SCHAFFER. That is also correct.

Senator HATCH. And yet you were the supervising attorney on the preparation of this particular report for the White House?

Mr. SCHAFFER. Yes.

Senator HATCH. Like Senator Metzenbaum here, I would like to know, did you feel any qualms at all about being the chief counsel in this case—in all of these cases, supervising, I take it—how many attorneys?

Mr. SCHAFFER. At that point, approximately 120.

Senator HATCH. You were chief counsel supervising 120 cases against how many claimants?

Mr. SCHAFFER. I'm sorry, I thought that you said attorneys.

Senator HATCH. I said 120 attorneys versus how many cases?

Mr. SCHAFFER. The radiation cases that we presently have I believe the 900 or so claims that are on file reflect about 500 to 600 deaths or injuries. There are, of course, multiple claims.

Senator HATCH. Just so we understand: You are the supervising attorney, supervising about 120 other attorneys in about 900 cases involving the issue of whether or not damages were incurred as a result of the radioactive fallout tests in Nevada during the 1950's and 1960's; is that correct?

Mr. SCHAFFER. Yes.

Senator HATCH. Did you feel any qualm at all about being the chief counsel in those 900 cases with the chief burden of defending the Federal Government from these claims and actually analyzing whether or not the Federal Government should provide compensation in these claims and whether or not 1865 is an appropriate way to do it?

Mr. SCHAFFER. Senator, I am troubled by the fact that everyone seems to feel that there is such a conflict. I really do not——

Senator HATCH. You don't see any conflict at all?

Mr. SCHAFFER. No; I don't. And if you will permit me to elaborate——

Senator HATCH. OK.

Mr. SCHAFFER. I had a relatively high position in the Department of Justice, which was a policymaking position. And I take seriously the mission of the Department of Justice.

Senator Metzenbaum referred to our raising technical defenses. Often the law—the Federal Court Claims Act and litigating a case in court—we all know, is a very inadequate way to resolve a social problem.

I think that part of the responsibility—the Department's responsibilities—in addition to litigating cases under the Tort Claims Act, is to try to respond to social problems.

We don't have the kind of incentive that an insurance company would have, or that a private law firm would have, to win, win, win. I know that we are accused of that, but I can tell you that the philosophy of the Attorney General and people immediately below him is very much that our principal obligation is to do justice. The people——

Senator HATCH. There is not pressure to win cases?

Mr. SCHAFFER. I'm sorry?

Senator HATCH. There is no pressure to win cases?—in the Department of Justice? None at all?

Mr. SCHAFFER. There is not the kind of pressure that I have previously seen in prosecutors offices, where they keep statistics and that sort of thing.

Senator HATCH. There is pressure to win, isn't there?

Mr. SCHAFFER. When we take a case to trial, we try to win, certainly.

Senator HATCH. Don't they keep statistics on attorneys?

Mr. SCHAFFER. Not in that sense. It is no failing to go to your superior and recommend that a case be settled.

Senator HATCH. No; that's just like any private counsel would do. But don't you know which attorneys in the Department of Justice are successful litigators, those who are tough, those that generally win, those who they can send in to tough cases? Can't you tell me who those are?

Mr. SCHAFFER. I can tell you who are good attorneys——

Senator HATCH. They are the ones who win, aren't they?

Mr. SCHAFFER. No; not necessarily. One of the reasons that I think they are good is that those attorneys used to come to me when I was their supervisor and say, "This is a case that we ought to settle, not because we are going to lose, but because we are responsible."

Senator HATCH. Isn't that a win, too? In other words, that is what a private counsel does. If they know they are going to lose, they know it is a case better off settled or something, they will go to their client and say, "We ought to compromise this case." I suggest that there really is not that much difference. I suggest there is just as much a win-syndrome, and perhaps even more, in the Department of Justice than in private practice.

Mr. SCHAFFER. Well, I—I don't agree.

Senator HATCH. You don't agree.

Mr. SCHAFFER. I know that some attorneys feel that way, but that is not the guiding philosophy, at least, in the Department of Justice.

We support private relief bills when we see a case that cries out for relief. Where there is a jurisdictional defense, technical, but a jurisdictional defense under the Federal Tort Claims Act, we have on many occasions come to Congress or suggested to plaintiff's counsel that he seek a private relief bill and we would support it.

Private law firms do not do that.

That is because we do recognize there are other obligations. For that reason, I did not ever feel that I was in a conflict of interest when I was chairing the task force.

Senator HATCH. All right.

Mr. SCHAFFER. And I don't think there is——

Senator HATCH. So much for that. I think that we made the point that there is a conflict of interest there. I feel you have produced a self-serving document which is designed to justify the decision and final conclusions you have reached.

Now, whether or not it was deliberately done or if that is just a litigation syndrome or of an advocate's approach, I'm not going to judge.

Let me give you an illustration. You said in your remarks today that:

> 1865 is overly broad in application. Simply speaking, the bill would provide damages to anyone who resided within the specific geographical area during the period of testing and subsequently contracted one of a number of forms of cancer.

Have you read this bill?

Mr. SCHAFFER. Yes, sir.

Senator HATCH. It is not that broad if you read it carefully. You don't maintain—you are not going to maintain that the bill is that broad that if they got cancer they got compensated?

Mr. SCHAFFER. If they have one of the enumerated forms of cancer and they resided in the area for the specified time period, it is my understanding that they can go into court and sue for damages. I didn't spell out all the details, but that is my basic understanding of how the bill works as far as the downwind people are concerned.

Senator HATCH. All right.

You also say:

> Secondly, if any compensation is to be provided, we believe that damages envisioned by 1865 are inappropriate and place an enormous and unwarranted burden on the American taxpayer. S.1865, in effect, presumes liability and permits the eligible claimant to litigate the amount of his damages in the United States District Court on the Federal Tort Claims Act.

Then you say at the bottom here:

> We believe that while this approach may be warranted in the traditional tort case, we believe it has no application in a situation whereas here negligence or wrongdoing has not been established and causation has not been and cannot be established.

Have you read volume I and volume II of our hearing in the joint hearings of the subcommittee on oversight investigations, et cetera, on the Committee of Interstate and Foreign Commerce, House of Representatives and Health and Scientific Research Subcommittee of the Labor and Human Resources Committee, and the Committee on the Judiciary of the U.S. Senate—have you read these?

Mr. SCHAFFER. I have read most of volume I and about half of volume II. I have not——

Senator HATCH. And you conclude that negligence or wrongdoing has not been established, causation has not been and cannot be established?

Mr. SCHAFFER. Negligence or wrongdoing is something people argue about. I am willing to presume negligence or wrongdoing.

But I stand by the statement that causation cannot be established. And I believe——

Senator HATCH. Wait a minute. What is your notion of the burden of causation. How do you define "causation"?

Mr. SCHAFFER. I believe——

Senator HATCH. How would you define a normal negligence case, a normal Federal Torts Claims Act case. Would you have a more stringent burden?

Mr. SCHAFFER. Not a more stringent. I would have even a more liberal one——

Senator HATCH. Wouldn't you agree with me that causation is the reasonable medical certainty that these actions occurred, or that these actions caused cancer?

Mr. SCHAFFER. I don't believe——

Senator Hatch. Do you have a medical expert who is qualified as an expert come in and say, "With a reasonable degree of medical certainty, cancer has been caused by the radioactive fallout tests in the 1950's and 1960's"?

Mr. SCHAFFER. I would very much like to know what medically qualified person would say that there is any evidence at all that all of these cases—or most of them even, were caused by this. Indeed——

Senator HATCH. Dr. Lyons said that in Salt Lake City. He said basically that it was his conclusion that it was a high degree of probability that the fallout tests caused the—caused cancer in a number of these cases.

He didn't say with a blanket degree all of them, because he hasn't examined them all.

Mr. SCHAFFER. I'm sorry, who said that?

Senator HATCH. Dr. Lyons.

Mr. SCHAFFER. Dr. Lyons has told me——

Senator HATCH. Dr. Lebassí, as an agent for the Federal Government admitted that the Federal Government was wrong.

So we have established wrongful acts; then causation through medical causation, at least with regard to the——

Mr. SCHAFFER. I think, Senator, that Dr. Lyons has been misunderstood and misquoted.

Dr. Lyon is also the cocustodian of the Utah Tumor Registry. He believes that the increase in childhood lukemia which he observed may have been caused by radiation. That is correct. That is 32 cases.

He also believes that there is no evidence whatsoever, and he is the custodian of all these statistics, that there has been no observable increase in any other form of cancer in the downwind area.

In April of this year, the University of Utah Medical School, the University of Nevada Medical School, and the Arizona Department of Health, under the direction of Dr. Chase Peterson, whom I am sure you are acquainted with, submitted a proposal to HEW requesting several millions of dollars to study the question of whether there is any evidence of causation in these cases. They acknowledge in the preface to that grant application that there is a great deal of public concern; they also say there is absolutely no evidence.

And this is the problem. Yes, with respect to the childhood lukemia, Dr. Lyons feels that there is no other cause which anybody has identified, and those are probably attributable to radiation.

Senator HATCH. That goes to the jury, right?

Mr. SCHAFFER. That's 32 cases.

Senator HATCH. His testimony would put that case to the jury?

Mr. SCHAFFER. That may be.

Senator HATCH. If we had other doctors come in and say with a reasonable degree of medical certainty that Mr. Fredericks' cancer was caused by radiation in the mines, or any of these other cases, cancer was caused by radioactive fallout tests, I think you would have to agree, those cases would go to the jury.

Mr. SCHAFFER. Well——

Senator HATCH. Under present negligence law and even under the Federal Torts Claim Act.

Mr. SCHAFFER. As I say, I have been working in this area, traveling around the country talking to people, and I have yet to find a medical doctor who will say (*a*) that he can distinguish a radiation-related cancer from a normal occurring cancer——

Senator HATCH. I used to defend as well as prosecute cases. I have yet to find a case where some doctors are willing to come in and testify that there is a link and a reasonable degree of medical certainty this particular medical condition was caused by this causative force. I suspect you are going to face all kinds of cases. Have you taken that into consideration where doctors are going to be willing to come and put in on the line and say that this case of cancer was caused by the radioactive fallout tests in the 1950's and 1960's?

Let me ask you this question. At our April 19, 1979, hearing Peter Lebassí testified that the President directed the Department of HHS to reevaluate the findings of early studies to determine if a higher—if there is a higher rate of lukemia, to reopen a study of thyroid disease of Utah schoolchildren, and a feasibility study to determine whether a resurvey of the original calculation could be accomplished.

In addition, the President wanted HHS to contract with the University of Utah to study the possible long-term health effects from radioactive fallout. What are the status of these studies?

Mr. SCHAFFER. I think the status of at least the latter, and I believe some of the other ones that you mentioned, may be incorporated and culminated in the grant application that I mentioned.

The University of Utah, and I believe the other universities were given money which they did some followup work on Dr. Lyons' study and ultimately produced this grant application. I believe that is pending now at HHS. I only became aware of the fact last week.

Senator HATCH. OK. In your testimony, I think you attempt to discredit the Lyons' study which established a relationship between exposure to radiation and higher rates of childhood leukemia among downwind residents. Are there any published studies that do that, discredit his testimony?

Mr. SCHAFFER. It was not my intention to discredit his testimony, only to point out that his study relates to 32 cases. If we are only

talking about those 32 cases, I think we would have a very different situation here. You see——

Senator HATCH. At the April 19 hearing, Dr. Frederickson, Director of NIH, testified that the Lyons' study indicated that "one must pursue vigorously further evidence to try to link those cases of leukemia with exposure to ionizing radiation."

And yet, over the past year, the administration's efforts seem to be just the opposite, namely, to discredit Dr. Lyons. At least it seems to me. Why the reversal? Where are the studies that should be pursued vigorously to try to link those cases with exposure to ionizing radiation?

Mr. SCHAFFER. I don't believe there has been an administration effort to discredit Dr. Lyons. Several people have written in other journals criticizing the report.

I think that what Dr. Frederickson referred to culminated in a grant of, I believe, several hundred thousand dollars, I don't have the exact figures on it, to Dr. Lyons and Dr. Peterson to do follow-up studies. I think some of those followup studies are reflected in this grant application. It involved a verification and followup of Dr. Lyons' data. The grant application that I referred to is much bigger—and incidentally spans a period of several years. It will involve several million dollars and several years.

And that underscores the point: I am not—I certainly am not trying to be dilatory. I stated before that I personally had wished that we could move much more quickly on this problem, but the doctors, and the doctors in those communities, feel that much more additional time is going to be necessary.

Again, if we could isolate the cases in any way, if we could even come up with a strong probability, we wouldn't insist on mathematical certainty, because we believe that is impossible.

Senator HATCH. The court is going to insist on mathematical certainty. They are going to have to have a reasonable degree of certainty. That is all there is to it.

Mr. Schaffer. That is one of the problems with the litigation. I think the kind of probability figures that are in the task force report indicate—even if those figures are dramatically off by a factor of two, they indicate that for most of these people, absent unusual circumstances, the probabilities are very low. Nevertheless, the task force recommended that we pursue a system of compensation based on those probabilities. That was in recognition of the fact that the legal standard, more probable than not, would probably—I don't want to comment on the litigation, but the task force's premise was that the legal standard might pose an impossible burden on these people.

So, we recommended that this alternative be pursued.

Senator HATCH. Yes, but your alternative is so narrow in scope that it might not compensate many people who really deserve compensation. To date, it has been estimated that the statistical work, which includes the number of citizens exposed to the radiation in question is approximately 25,000 to 35,000 people.

Your past statements, however, and at least the press statements released in connection with your report expand this number to 175,000 people. I wonder if you would tell us why?

Mr. SCHAFFER. I don't know exactly where the 30,000 figure comes from. I suspect that somebody drew a line on some particular dose. The 172,000 is the population of every community where there was a recorded measurement.

Now, that is not to say that everybody——

Senator HATCH. Those communities as they existed in 1950 and 1960, or as they exist today?

Mr. SCHAFFER. As they existed during the period of——

Senator HATCH. Now, it appears to me we have always been talking about 30,000 to 35,000 people. All of a sudden, we get a report for 170,000 people. It looks like the Government has expanded this number to the impact of those ultimately exposed.

In 1950, Cedar City and St. George had a population of about 4,500 persons each. And they are the two primary towns exposed to the impact.

It seems to me that this administration has expanded the art to include all of southern Utah and order the rendering of how much radiation exposed against population would seem less rather than more.

Now, although there may be people in all of southern Utah that may be able to show some relationship of their contraction of cancer to the fallout tests in the 1950's and 1960's, it still is a relatively much smaller number than the 170,000 which you have chosen. You have not taken time to break that number down and get it down to a reasonable level.

Mr. SCHAFFER. I think—this is a guess, but as I said in my statement, of the 172,000 there were 140,000 exposed to less than 1 rem. Less than 1 rem is a relatively small dose.

Senator HATCH. Who knows that? How can you conclude that?

Mr. SCHAFFER. We can conclude it only based on the—we cannot reconstruct, and do not want to reconstruct——

Senator HATCH. That is not a very scientific approach.

Mr. SCHAFFER. We have the information from all of the dose monitors that were set up. Those are available on a computer printout, they have been assessed, the scientists have looked at them, and——

Senator HATCH. This is a scientific projection on a computer model—or this is a computer model projecting scientific——

Mr. SCHAFFER. The dose indication—there were film badges and air monitors set up at hundreds of locations. These were recorded and there has been a computer run of all of those. Each individual badge reading for each individual test. I think——

Senator HATCH. You and I both know that statistics and computer models can make them come out anyway you want with regard to these matters.

And it just so happens that this computer model comes out diminishing the expected claims that we have.

Mr. SCHAFFER. I don't think that that is really right. We said that—and this, too, I think, is a remarkable statement because it has never been made before in twenty five years, we said that the existing dose measurements could be in error by a factor of two. That's all we have. There is no other basis to speculate other than the readings that were taken at the time. We admitted that those,

for the population as a whole, those could be off by a factor as much as two.

For individuals in that population, that could be off by as much as five, a factor of five.

Senator HATCH. I have to run to vote. I still have further questions that I would like to bring up with you.

And then I would like to call as our last witness Mr. Stewart Udall, and if he cares to have with him former Congressman Wayne Owens, we would be happy to have him testify as well.

I apologize to you, Mr. Schaffer, and to everybody here for the interuption. I will run over, vote, come right back, and we will finish with you, then call on Mr. Udall.

[A short recess was taken.]

Senator HATCH. Mr. Schaffer, one of the things that I find problematical with your report is that the report seems to ignore some of the most damaging evidence against the Government. For instance, I think the report ignores the lack of warning by the Federal Government and the approach by the Government that there is no danger here, you can go out and watch this if you like the holiday approach that occurred.

Some of the testimony concerning that came out in our Salt Lake and also in our St. George hearing. Is there any particular reason why all of these moral questions, really, were basically not addressed by your report?

Mr. SCHAFFER. Senator, first of all, let me say that I don't agree with the statement that no warnings were given. One can dispute, if one wants to, whether the warnings were sufficient. But people were told to stay inside in 1953. In 1950, leaflets were dropped saying, "Stay away".

The warnings got better, the standards got better. We were on a learning curve.

Now, the reason that it was not mentioned in the report, was that we did not need to get into that if our recommendation was going to be that you should do something. If our recommendation was going to be that we had no responsibility, then we probably would have had to address those issues.

But that was not our recommendation. Our recommendation was—and it was the first time any administration has made such a recommendation—that we should try to do something for these people. The reason for doing it, it seems to me, is irrelevant once you say that we are going to try to provide compensation. Whether we were negligent, whether we were guilty of any wrongdoing becomes really irrelevant, just as it does in a trial. Once liability has found or stipulated to, you can go on. That's why it is not in the report. But I don't agree with the statement, I want to be clear on that, because we have seen a learning curve both in terms of the standards that were applied to radiation doses and in terms of what we knew about fallout. Fallout was not known very well when we started the testing in the 1950's. We learned a heck of a lot about it.

And as we learned more and more about fallout, and as we learned more and more about the health effects, the warnings got better. If you plot these things over time, you see a very different picture than the picture that has been presented to date.

Senator HATCH. I might mention that Mr. Lebassi testified in Salt Lake City, he said that there were no basic warnings.

There was also a 1954 AEC News release exonerating fallout as the cause of the bazaar, deaths of hundreds of sheep in Utah. And, of course, Dr. Harold Knapp testified, as a former AEC official was virtually forced to resign back in 1953 after concluding that the residents received far more exposure to fallout than the AEC and fallout recipients.

What I am saying is that I think these things should have been addressed in your report a little more thoroughly than they were.

I might also mention that I find fault with the report because you relied on external evidence as the cause of cancer, but not the internal evidence as well, such as the ingestion of food that was contaminated as a result of radioactive fallout. If you can cover whole railroad cars with radioactive fallout dust, I presume that food growing in the fields also could be contaminated as well.

Mr. SCHAFFER. The question of internal dose is included in that factor plus or minus five. Unfortunately, we don't have any objective indicators of what the internal dose was, but the people who studied it, and they were scientific people, said, that Whatever the effect of the internal dose was, and it would vary depending on people's dietary habits, etc. would be included within this factor of plus or minus five."

The only thing that that doesn't include is the milk which——

Senator HATCH. Of course, the report gives conclusive weight to the sketchy and very inadequate data which was then available.

Mr. SCHAFFER. Again, if we had it to do today, we would have much more extensive data. That's the only data we have and——

Senator HATCH. You have to admit that data is somewhat inadequate.

Mr. SCHAFFER. And that's why we included that factor of plus or minus two on the calculations. That's how we get up to the numbers that we get up to. We are taking that into consideration. And we were criticized by scientists who said that we were being over conservative and we were multiplying the conservative assumptions that we applied.

We don't have any other data, so our only way of coming up with any number at all was to take the worse-case hypothesis. And that in effect is what we did.

If the film badge read this, and we assume that it was totally off that day, and we assume that it was in the shade rather than in the sun, we assume that it was out of the most fallout, what is the worst possible dose that is consistent with this thing, since we knew the film badge was there. That's how we came up with the factor of plus or minus——

Senator HATCH. Based on faulty data, even though you tried to give the leeway.

Mr. SCHAFFER. I don't think that the data is faulty, I think the data is——

Senator HATCH. Sketchy.

Mr. SCHAFFER. Sketchy in terms of what we know today. We would definitely have more monitors, and I believe that we took that into consideration.

Senator Hatch. Government documents show that the exposure guideline in effect during the weapons program was 3.9 rems per year. Although the level was frequently exceeded, in St. George, Utah, that was when the population was around 5,000 people, they got 6 rems from just one test shot on May 19, 1953. That is pretty well concluded. How did you calculate that only 6,000 people were potentially exposed to more than 6 rems during the whole testing program?

Mr. SCHAFFER. Most of the people who were exposed to 6 rems were in St. George. The cumulative dose for the whole period of the testing has been calculated to be the 6 rems.

Most of those, if you look at that population chart given in the report, you will see that St. George is the only large population center that got that kind of a dose. But that's—it is from that chart that we used 6,000.

Again, that's only an example. But it was an effort to quantify the problem.

Senator HATCH. Are your estimates of possible cancers related to low-level radiation based on the so-called linear model? Or what are they based on?

Mr. SCHAFFER. They were based on the linear hypothesis.

Senator HATCH. As you know, Mr. Lebassi reported—his report indicated this method significantly underestimated the numbers of cancers.

Mr. SCHAFFER. I don't know that. There is always that possibility since all of those are only hypotheses. However, the best medical thinking is that the linear hypotheses—at least a majority of the scientists, not just government scientists, but the United Nations and everybody else who studied it on the International Committee—is that the linear hypothesis is conservative, that is, it probably overstates the risks. And that is consistent, incidentally, with the study that was released last week by the Mayo Clinic. I would be happy to furnish that study.

Senator HATCH. Do you believe the Government already has adequate research and treatment facilities, thus making provision for a kind of Mayo Clinic operation as described in bill S. 1865 unnecessary? Do you believe that the Government already has facilities which makes that provision unnecessary?

Mr. SCHAFFER. I believe that the issue should be further studied. And we support efforts to further study, further quantify, and further we support anything that will shed more light on this issue.

Senator HATCH. Then I assume that you would agree with me that the Department of Energy is currently inadequately staffed and funded to carry on the Health Office functions for the radiation related question?

Mr. SCHAFFER. I can't agree with that statement. I think that recommendation of the Lebassi task force for an inter-agency research council has been followed. I think that group and the Office of Science and Data Technology has concluded that no reassignment of the research functions is appropriate. And I know that the administration strongly opposes that provision in the bill.

We at least ought to get the benefit of a newly created interagency research radiation group that was set up in direct response

to the recommendations of the Lebassi task force before we make any changes.

Senator HATCH. Do you agree that that testimony of Mr. Lebassi and other agencies of the Federal Government would be inadmissible into court?

Mr. SCHAFFER. I would have to study that——

Senator HATCH. It would be in the agency relationship, especially those at a high level like Lebassi was.

Mr. SCHAFFER. I don't have any doubt that the plaintiff's would try to introduce such statements, whether they would be admissible, I don't want to comment on.

Senator HATCH. All right.

I have some other questions, but we will submit these in writing in the interest of time. We appreciate your coming and trying to enlighten us on the report.

Mr. SCHAFFER. Senator, during the recess, some people from the gallery asked me some questions which leads me to think I may have created a misapprehension.

When you asked me the number of attorneys that I supervised, I was referring to the number of attorneys overall that I supervised. That is not the number of attorneys the Justice Department has handling radiation cases, and it is not the number that is working on this case.

Senator HATCH. What are those?

Mr. SCHAFFER. We have myself and two attorneys at the Department working on this case and one assistant U.S. attorney, for a total of four.

Senator HATCH. Total of 4, not 120.

Mr. SCHAFFER. That's right.

Senator HATCH. I thought that seemed a little high. OK. I appreciate your testimony and am glad to have it on the record.

Mr. SCHAFFER. We will respond to any further questions you would like for us to.

Senator HATCH. Thank you so much.

I would like to call at this time on Mr. Stewart Udall and former Congressman Owens, if he cares to testify.

I want to give you the opportunity of making any comments and any materials into the record.

So, we will turn the time over to you.

STATEMENT OF STEWART L. UDALL

Mr. UDALL. Senator, I appreciate this opportunity to respond. I must be candid, I have been saddened and sickened by the response of the Carter administration here today.

Senator HATCH. You are not alone.

Mr. UDALL. If Bill Schaffer is still in the room, I want to say I think this whole business of suddenly switching and instead of talking as the Atomic Energy Commission did all through the aboveground testing period that the exposed group within a 200-mile radius, 25,000 to 35,000 people, and to now switch and talk about 170,000, is just intellectually dishonest.

Senator HATCH. It just makes you wonder how they could do that——

Mr. UDALL. It obviously serves their purpose: It dilutes the damage, it enables them to minimize it.

We have had no discussion here today about the most distressing thing of all, the Department of Defense letter, which was a hard-line document indeed.

It really says to me that after all that Congress has done, after all that has happened in the last year, we are back to ground zero. The AEC and DOD are back in the old trenches, and the report that the interagency task force prepared was a rehash of the Lebassi report, a rehash of all the old materials—essentially it is a study of a wrong by the wrongdoers. We don't accept it; we can't accept it.

A lot of the material in the computer is garbage, and they know it. Yet they present it as fact.

One senses throughout these reports, in testimony today, the heavy hand of OMB. Don't let them in the door, they counsel, because we don't know where it will lead. It is as though the U.S. Government, when the first airplane accident cases were brought under the Federal Tort Claims Act, said, "We can't concede an inch, we can't let any passengers or persons killed in airplane accidents win a case; otherwise, who knows where it will end?" That is, in effect, what they are saying.

I find the U.S. Government has a double standard. I want to say that today. It is one of the things that angers me everytime I think about it. We have spent $121 million studying the Japanese victims of Hiroshima and Nagasaki, giving them medical care, testing them, providing solicitous care for them. I have no criticism of that, I think that it has been a humanitarian thing. It is also a medically necessary thing.

But we made a test laboratory out of Nevada and Utah and the few little studies made of these people were pathetic.

You would never know from Mr. Schaffer's presentation here today that there was a suppression of evidence—that things were swept under the rug; as a matter of fact, the Carter administration has essentially rejected the option that we tried to get them to agree to last year to be generous, to try to begin by settling the leukemia cases. They have gone back to a hardline position.

Senator, I just find it distressing.

Mr. Schaffer finally admitted here today that he will give some credence to the children dead of leukemia because of Dr. Lyons' testimony. I pleaded with him all last spring—and with others in the Carter administration—to settle these cases as a way of saying something to the country and to the people in Utah and Nevada, that this Government is honest and it cares about people.

Now, we are back in a hard-line posture.

As you can see, I am very upset at what I have heard here today because if the Nation will whip out its checkbook to move decontaminated dirt around to a tune of $100 million, if we will pay the people in the Marshall Islands, then there is a flaw that runs through the Schaffer report when they ask us to accept are their figures on external doses.

The medical people are all agreed now that the children who were killed probably ingested radiation through the milk, got it

through the food, heavier doses than the people in the Marshall Islands had.

So, why are we settling with the people in the Marshall Islands and not with U.S. citizens?

And when it comes to settling with our own people, we say, "Take a hard line. Give them nothing." That is essentially the position that the Carter administration is coming out with. I believe if they hold to the position they have adopted today, they are saying, "Don't pay anybody anything, don't settle anything." They refuse today even to come up here and discuss the uranium miner problem. It is a horror, it is still going on, it is not over with. I find it shocking.

I guess I have said enough, Senator, to unburden myself here today on behalf of my clients. This is a big problem, it is a national problem, and it also includes the test site workers in Nevada who are dying, people who lived and worked in that poison pit as a work environment.

If this administration doesn't want to face up to the horror and reality of what was done, if they are going to dodge and duck as they have today, and tell us that 5 years or 10 years more of studies are needed, then all the people will be dead when the Government finally makes up its mind what to do. I think that it is unfortunate.

Senator HATCH. In other words, our bill provides a special advisory panel to determine who can, within a certain framework, recover for damages inflicted. Then they are going to have to prove damages, and that is going to be a difficult thing to do.

I don't know what would be the better approach. Do you think it would be better to have the workman's compensation approach on a higher compensation level than the average workman's compensation? Or should we allow the irrebuttable presumption that we provide in our bill, plus the burden of proving damages?

Mr. UDALL. Senator, I was surprised that they came in today saying that's a bad bill, we are against it. I expected the administration to say, "Well, there is some good features to it, it could be amended, it could be changed. Or they could present their own substitute legislation, as the Schaffer report hinted they might do.

They haven't done that, they apparently don't intend to do that, unless Congress holds their feet to the fire.

I want to close by just adding one little personal story. The last time I was at St. George was in late February and I had seen a copy of the interagency task force report. I met with a group of 30 or 40 people, of these patient, accepting people. I told them about what it appeared the Carter administration was getting ready to do, that they were proposing a kind of a welfare program, maybe some people would get their medical bills paid, and so on.

One man spoke up and said they lost a daughter back 25 years ago, and he said, "Mr. Udall, if they are not willing to admit that they lied to us and misled us—because," he said, "If we had known what we know now, we could have moved our families, we could have saved the lives of our children. They lied to us and unless they are willing to admit that they did something wrong and come clean," he said, "If they are saying to me now they will pay my daughter's burial expenses, tell them to go to Hell."

I think this man was speaking for a lot of the people of southern Utah when he made that statement.

Senator HATCH. That sums it up. You made the point that they were worried about setting bad precedents, when, in fact, our Government has a double standard because it has helped those in foreign lands who have suffered as a result of our—of testing, and in the case of the Japanese people, actual explosion of the devices.

So, I suspect that you made a pretty good point there.

I also believe that you make another point, and that is: that this report basically is sanitized. The readers would hardly guess that large numbers of children died of leukemia or that members of some families died of cancer.

One of the things that the report seems to ignore is the human side of this tragedy, and most of the time, I have found the Federal Government willing to bend over, at least give the benefit of the doubt to those who have suffered human tragedy in our society. In this report, there isn't any consideration given to the human aspect of what you would describe as the moral aspects, of these problems over that almost 20-year period.

Mr. UDALL. Senator, I thought for awhile that I was out of my mind and there were two different hearings going on in this room. What this committee found, what the Senators were saying, and what the Carter administration presented was so much at variance we seemed to be passing in the dark on different wavelengths.

Senator HATCH. I agree. There is mention in the report of the cover up concerning the sheep case. That is pretty well admitted today, it was admitted by governmental witnesses in Salt Lake City.

Of course, there are a number of other aspects that I think the Report should have covered.

Would you care to submit to us a formal document that we would put in the record concerning your criticism of the report? Then we will ask Mr. Schaffer to respond to it.

Mr. UDALL. Yes, I think we would be willing to do that.

Senator HATCH. That would be a worthwhile way of approaching this problem. Perhaps we could resolve it for the benefit of all concerned.

Let me just say in closing these hearings, I appreciate you being willing to take time today to be here.

Congressman Owens, do you have any statement you would care to make?

Congressman OWENS. Senator, I wanted to make two very brief points: First of all, I think it regretable that the Justice Department did not send a responsible, at least Assistant Attorney General here today. Bill Schaffer is a very competent trial lawyer, but even a trial lawyer of his competence is not adequate for the purposes of this subcommittee today. You were entitled, I think, to have at least an Assistant Attorney General.

I hope that the suggestion of Senator Metzenbaum will be followed and that a month from now you will have an Assistant Attorney General up here explaining what their position is; some responsible official.

Senator HATCH. Maybe it would be well to have him explain it with the argument you and Mr. Udall have put forward so that he can respond to it in that context.

Congressman OWENS. I just hope that this subcommittee will follow that and have a responsbile Department of Justice official up here.

The second point, a very compelling problem is the one which Mr. Frederick outlines so well today in that 13 of 15 miners have cancer. The other two are under that sentence, obviously. As he points out, 30 to 40 percent of all the miners there have contracted cancer.

You will be interested to know that there is no Government program, even with this kind of evidence available, aimed at monitoring that situation and alerting those men and taking regular chest X-rays, or whatever, to determine—there is no adequate medical assistance available to those miners who can be defined.

I am wondering about the compelling need, and maybe this Subcommittee would want to do that, ask the appropriate government agency to monitor that situation and help these individuals. If that is caught at the very right time, as it was with Mr. Frederick, and it was with a man named Carl Norton, they can save those men's lives. Those men can be diagnosed and dead within a matter of 2 or 3 weeks.

Senator HATCH. I think that one of the benefits coming in the wake of our hearing concerning these bills is a recognition of the serious problem on our hands, of the needed work yet to be done resolving the various conflicts which exist. We've got to start taking care of our people so they won't suffer these types of debilitating diseases as a result of Government's failure to act.

We are doing something for the future. Now, what we have to do is make up for the past, to help those who suffered as a result of these tests. The patriotic victims previously testified that they would have gone through them if they had been warned, that they would have allowed the tests to occur because of the national interests involved. A number of our witnesses in Utah said that. I don't think that this means that they have to suffer unnecessarily without some degree of compensation by the Federal Government.

Mr. UDALL. I sense no compassion by the Government of the United States. And that is what troubles me very deeply.

Senator HATCH. I will go one better. I sense little compassion by this administration, but I think that the Government will be compassionate in the final analysis. This is our goal.

Congressman OWENS. Senator, I know that our clients would want us to express our appreciation for your great interest in this, your willingness to follow the details, which is where a solution will come from.

Senator HATCH. We are happy to have both of you here today.

Mr. UDALL. Thank you.

Senator HATCH. At this point I order printed all statements of those who could not attend and other pertinent material submitted for the record.

[The material referred to follows:]

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July 3, 1980

The Honorable Edward M. Kennedy
Chairman
Health and Scientific Research Subcommittee
Labor and Human Resources Committee
United States Senate
Washington, D. C. 20510

Dear Mr. Chairman:

The American Mining Congress appreciates the opportunity to present our comments on S. 1865, a bill that would make the United States liable for diseases suffered by uranium miners as a result of exposure to radiation in uranium mines during the 1948 to 1961 period. We therefore ask that this letter be entered as part of the official hearing record.

The American Mining Congress is a national trade association composed of companies that produce most of America's metals, coal and industrial and agricultural minerals. Its membership also includes more than 250 companies that manufacture mining and mineral processing equipment and supplies.

The subject covered in the legislation is one of considerable concern to the uranium mining industry. We wholeheartedly support the concept that employees or their dependents ought to be compensated for disabilities or deaths incurred from hazards encountered in the course of or as a result of their employment. We are concerned about the health and well-being of our employees and their families and want to see every appropriate step taken to safeguard their interests.

The American Mining Congress believes that the appropriate means for providing such compensation is through the framework of state workers' compensation programs. We regard as unique, however, the situation in which some uranium miners were exposed to radiation hazards in the 1948-1961 period. This viewpoint was expressed to the House Education and Labor Committee in 1968 in the American Mining Congress testimony in support of federal responsibility for compensation of lung cancers in uranium miners resulting from overexposure in the early years of the uranium procurement program.

There were special circumstances which set this 1948-1961 period apart. Uranium production was undertaken in response to a crash federal program oriented to national defense. It is therefore reasonable to assert a federal responsibility for the special hazards that

were not adequately understood at that time -- and in so doing to distinguish this matter from other work-related injuries that should be compensated under normal state worker compensation arrangements.

When, in early April 1948, the Atomic Energy Commission (AEC) formally embarked on its guaranteed uranium purchase program under government-established prices, it did not require operators of uranium mines to take any special precautions to provide uranium miners protection from excessive radiation and did not include in its prices for uranium any amount to cover the cost of such protection.

The AEC relied on and frequently cited the language of the 1946 Atomic Energy Act, stating that its jurisdiction over uranium ore began "after its removal from its place of deposit in nature." The Commission took the position that it was not required to regulate the mines. Others argued, to no avail, that there was no prohibition against such regulation. Consequently, exposures of some miners to radiation in underground uranium mines were excessive in the late 1940's and the 1950's. In addition, a number of miners had received excessive radiation exposures prior to 1948 because many of the mines which produced uranium for the Atomic Energy Commission starting in 1948 had previously been mined for vanadium.

Much progress has been made in reducing employees' exposure to radiation since about 1963; however, questions arise as to compensation for impairment of the health of some of the miners employed underground in those early days of the federal uranium procurement program.

Until the early 1960's the workers' compensation laws in some of the states in which underground uranium mining took place did not recognize the lung cancer which some people developed from exposure to excessive radiation as an occupational disease. The long induction-latent period (15 to 20 years on the average) from time of first exposure to excessive radiation to development of diagnosable lung cancer often meant that statutes of limitations based on time of exposure kept some claims from being recognized.

These state laws have since been amended and now lung cancer is recognized in uranium mining states as an occupational illness and the statutes of limitation have been changed in these states to run from the time lung cancer is diagnosed.

We agree that the federal government has a responsibility for the special hazards experienced by uranium miners during the period when the AEC was the sole purchaser of uranium. The special hazard unique to uranium mining during this period, however, was excessive exposure to radiation in underground uranium mines. The only radiation-related occupational disease suffered by uranium miners is lung cancer.

Conversely, pulmonary fibrosis is a disease that may occur in underground miners as a result of overexposure to a number of mineral dusts. It has long been recognized as having a possible occupational origin and is therefore compensable through state workers' compensation programs. Thus, accidental injuries and occupational diseases, other

than lung cancer, suffered by uranium miners during the 1948-1961 period, were covered by the state workers' compensation laws and awards were made, or disallowed, on the basis of evidence before the appropriate state agency.

We therefore believe that the federal responsibility for damages to uranium miners during the 1948-1961 period should be limited to those attributable to lung cancer.

Radiation and Its Effects

Set forth below is a brief review of mine radiation, its detection and control, and a brief history of the mining industry's efforts to limit miner exposures.

Radon is an odorless, colorless gas which is the product of radioactive decay of radium, a solid, which itself is a product of a radioactive decay chain starting with uranium. This chain decays through a set of intermediate radioactive products until radium if formed. Thus, wherever uranium is found in nature, some radium and radon are present. Radon decays radioactively by giving off alpha particles and has a half life of 3.8 days.

Therefore, when an individual breathes air containing radon, most of it is exhaled before many alpha particles are given off. The principal lung radiation hazard is from a chain of four successive short-lived radioactive decay products of radon. These "daughters" have short half lives ranging from 26.8 minutes down to 0.000164 seconds. Two of them decay by giving off alpha particles and have the shortest half lives -- 3.05 minutes and 0.000164 seconds. The other two decay by giving off beta particles which are not harmful because of their very low energy. All four radon daughters are solids.

Radon seeps out of rock at a rate that depends on the permeability of the rock, the radium content, and the air pressure. In an underground uranium mine it diffuses out of the walls of the workings and mixes with the air confined in those workings and then begins to disintegrate into its solid daughters, atom by atom.

Since its disintegration is by atoms, and the radon is mixed in the confined underground air, the daughters that form are invisible, atom-sized particles suspended in the air. They tend to attach themselves to any non-gaseous materials with which they come in contact -- such as droplets of moisture, dust particles, or the walls of the confined underground working. While they are suspended in the air, either unattached or attached to moisture or dust particles, they can be inhaled. Once attached to a solid surface, they cannot be inhaled and become harmless, unless forced back into the air by some violent action.

Because of their tendency to attach themselves to other solids, radon daughters are easily filtered out of air. For this reason, filter-type respirators that are approved for protection against radon daughters, although uncomfortable to wear for long periods of time, do give the wearer very good short-term protection when worn properly.

The hazard from radon is negligible compared to that from radon daughters. Radon and radon daughters in unconfined air are not considered to be an occupational hazard because the large amount of unconfined air dilutes them to virtually background levels. Since radium is present in all soils in small quantities, radon is therefore constantly being emanated into the earth's air. Radon and its daughters are present in small concentrations in all unconfined air, and in higher amounts in any confined air, such as is found in buildings, caves and mines.

Exposure to excessive concentrations of radon daughters causes cancers to start in the bronchial tree and in the lungs among a small percentage of individuals. The percentage who develop lung cancer varies with the degree of concentration of radon daughters inhaled, the duration of exposure, whether or not the persons exposed smoke cigarettes and the degree to which they smoke them.

In a U.S. Public Health Service (USPHS) study group of white underground uranium miners (all of whom started uranium mining in 1960 or before) through 1978, about 9% of those who smoked cigarettes developed lung cancer and about 1¼% of those who did not smoke developed lung cancer. Of a smaller Navajo study group, who smoked much less than the white group, the figures are about 4% and 1¼% respectively. These figures compare to 4% for the total U.S. population but may change with time, especially those of the Navajo group, as additional cases occur.

One practical problem encountered in trying to reduce exposures in uranium miners is that many of the people involved, especially in the early years, simply were not impressed sufficiently with the theory that a gas and particles they could not see, smell or feel might cause them to develop lung cancer in 20 years. Since many of the protective measures must be undertaken by the individual miners themselves, early progress in this field was slow. Now that actual statistics are available demonstrating the incidence of lung cancers, miner awareness in this area has increased.

Early Attempts to Detect and Control Radiation

Some recognition of the problems associated with radon daughters came during the 1940's due to the activities of the USPHS. Accordingly, since 1943 the average exposure concentrations have been steadily reduced. (See Figure 1 and Table 1 for a chart and table of these numbers year by year.)

In 1956, H. L. Kuznetz of the USPHS published a field method for determining radon daughter concentrations in mine atmospheres. This method was republished in 1957 by the USPHS in Publication Number 494, an excellent early booklet on the measurement, effects and methods of control of radon daughters, which was distributed widely in the industry. Prior to this time, operators had depended on occasional samples taken with cumbersome equipment by state and federal public health representatives. The Kuznetz method enabled concerned operators to begin making their own determinations.

In 1957, a conference in Salt Lake City adopted a unit of measurement of the concentration of alpha radiation in a liter of air and named it the "Working Level". In October, 1960, the American Standards Association (ASA), now called the American National Standards Institute, a joint industry-government-public venture, adopted and issued its N7.1 Standards on Radiation Protection in Uranium Mines and Mills, specifying an atmosphere of one Working Level (1 WL) as the maximum permissible concentration of radon daughters based on averaging readings over a 13-week quarter of a year.

A few years later the U.S. Public Health Service, in the course of its studies of uranium miners, defined a unit of exposure called a "Working Level Month" (WLM). This unit has been standardized at 173 hours (the average number of working hours in a month if a 40-hour week is worked) of exposure at one WL. An individual's exposure in WLM for a given period of time is the number of hours worked multiplied by the average WL for those hours, divided by 173 hours per month.

During the late 1950's, the nature of the uranium mining industry changed greatly. In the early years of the AEC procurement program, most uranium deposits were small, easily discovered and developed. The vast majority of the operators were self-employed miners with a few relatives or other miners as partners and workers. Many of these people had no formal technical education or training and had learned their mining on the job in non-uranium mines where excessive radiation was not present.

As major organized mining companies began to realize that the AEC procurement program would last long enough to recover investments in exploration for and development of larger uranium mines, they began to explore for larger and deeper targets and made multi-million dollar investments in the business. They brought formally trained engineers of various types into the business who better understood the health effects of radiation and were able to plan ventilation schemes to dilute and carry away the radon daughters more efficiently. Among the steps taken by most of the new larger companies were:

- The adoption of company rules prohibiting smoking in uranium mines in recognition of the increased risk of cancer from the combined effects of radiation and smoking. This policy was later adopted by the federal government as a regulation which is still in effect.

- The incorporation of sputum cytology techniques into pre-employment and annual physical examinations for the early detection of lung cancer.

- The establishment in New Mexico (1958) of uniform physical examinations and accumulation of data on employee smoking habits in anticipation of a large scale study being done some time in the future.

In 1977, a study of New Mexico uranium miners was initiated to determine the effects of today's low exposures. It is financed by twelve New Mexico operators and to guarantee its scientific reliability and independence has been contracted to the University of New Mexico. Due to the long induction-latent period of lung cancer, this study will take many years to produce definitive results.

Recent Federal Regulation

In 1961, the Federal Radiation Council initiated studies on radiation exposures in uranium mines. In mid-1967, the FRC's recommendation of limiting exposure to radon daughters to 12 WLM for a twelve-month period was signed by President Johnson for the guidance of all federal agencies. The FRC continued its studies of the subject and subsequently recommended that the exposure be limited to 4 WLM per year, effective July 1, 1971.

Under the Federal Metal and Nonmetallic Mine Safety Act of 1966, the Bureau of Mines, U.S. Department of the Interior, published its first mine radiation standards in February 1970, following the recommendation of the FRC of 12 WLM per year. The standards called for corrective action if working place concentrations were between 1 and 2 WL and withdrawal of workers if concentrations exceeded 2 WL. Exposure records were required of miners working in areas of .3 WL or greater. The annual exposure limits were lowered to 4 WLM in mid-1971 as recommended by the FRC.

The Bureau of Mines and the Mining Enforcement and Safety Administration (MESA) in the Department of the Interior, and now the Mine Safety and Health Administration (MSHA) in the Department of Labor, have continually strengthened the mandatory standards for uranium miners relating to radiation exposures. Presently, concentrations of radon daughters in active working places are not to exceed 1 WL and no one is permitted to be exposed to more than 1 WL without respirator protection. Inactive mine areas with concentrations of more than 1 WL must now be posted and workers who must enter areas where concentrations exceed 10 WL must use air-supplied breathing apparatus or other extra respiratory protection.

Although only a limited health hazard in underground mines, exposure limits for gamma radiation were established in 1977.

Following a review of the mine sampling practices and record-keeping systems by MESA in 1976, extensive new standards for periodic sampling of uranium mine workplaces and for determining individual exposure records were promulgated June 1, 1979, to become effective August 30, 1979. Although many of the requirements of the new sampling and recordkeeping standards have been followed by most of industry for a number of years, the new mandatory requirements should provide even more accurate and uniform reporting of radon daughter exposures.

Figure 1 and Table 1 show the steady decrease in average exposures over the years since 1943.

If you wish, we will be happy to have uranium mining specialists from our industry review this with you and your staff.

Sincerely,

J. Allen Overton, Jr.
President

FIGURE 1

Average Concentrations to Which U.S. Underground Uranium Miners Were Exposed in Working Levels

Sources: United States Public Health Service, United States Bureau of Mines and Atomic Industrial Forum

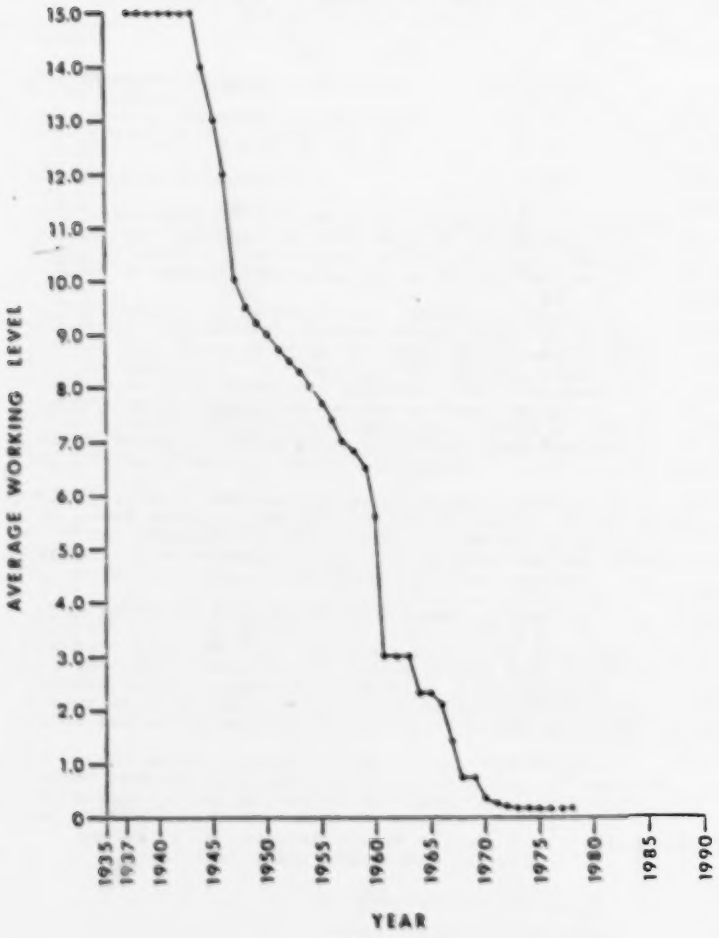

TABLE 1

Average Concentrations in Working Levels
To Which U.S. Underground Uranium Miners Were Exposed
By Years *

Year	Average WL	Year	Average WL
1937	15.0	1960	5.6
1938	15.0	1961	3.0
1939	15.0	1962	3.0
1940	15.0	1963	3.0
1941	15.0	1964	2.3
1942	15.0	1965	2.3
1943	15.0	1966	2.1
1944	14.0	1967	1.4
1945	13.0	1968	0.75
1946	12.0	1969	0.75
1947	10.0	1970	0.38
1948	9.5	1971	0.31
1949	9.2	1972	0.20
1950	9.0	1973	0.15
1951	8.7	1974	0.16
1952	8.5	1975	0.15
1953	8.3	1976	0.15
1954	8.0	1977	0.14
1955	7.7	1978	0.14
1956	7.4		
1957	7.0		
1958	6.8		
1959	6.5		

* Sources: U.S. Public Health Service, U. S. Bureau of Mines and Atomic Industrial Forum

THE NAVAJO NATION
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PETER MacDONALD
CHAIRMAN

JUN 2 1980

The Honorable Howard M. Metzenbaum
U. S. Senate
347 Russell Senate Office Building
Washington, D. C. 20205

Dear Senator Metzenbaum:

Your leadership and initiative in introducing S.1865 to relieve the suffering of those Navajos who worked for years in uranium mines without protection from radiation hazards is deeply appreciated by the Navajo Nation.

As Chairman of the Navajo Tribal Council, I have personally witnessed the tragedy which was so unfairly visited upon those of my people whose health was traded for the security of this nation. The efforts which you, Senators Kennedy, Hatch and Schwieker have expended in introducing S.1865 and conducting hearings on this measure are a positive and welcome step toward alleviating the misery of those whose lives have been damaged by the awesome effects of radiation exposure.

We are grateful for your attention to the testimony of Mrs. Jesse Harrison, Mr. Harris Charlie and Mr. Harry Tome which was presented at the hearing, which you recently chaired. I am enclosing additional comments of the Navajo Nation for inclusion in the record of that hearing.

I have requested that Mr. Raymond Lancer, Executive Director, Division of Resources or Mr. Harold W. Tso, Executive Director, Environmental Protection Commission, make themselves available to assist you or your staff in whatever future endeavors may be helpful in securing passage of this important bill. These Navajo officials may be reached at 602/871-4941, extension 1592 or 1703.

The Navajo people strongly support your efforts with a renewed hope and deep appreciation. At a time of increasing callous on the part of so many government officials, your sensitivity to our needs is especially gratifying.

Sincerely,

Peter MacDonald, Chairman
Navajo Tribal Council

67-381 O—80——6

STATEMENT BY PETER MACDONALD
CHAIRMAN, NAVAJO TRIBAL COUNCIL

Bill S. 1865

This bill appears to compensate those people whose health was adversely affected by exposure to offsite radiation from certain Nevada Test Operations and uranium miners. The category of miners should also include uranium mill personnel and other uranium processing workers in view of the radiation affects of uranium dust escaping from processing units.

The Environmental Protection Commission of the Navajo Tribe has determined that rock containing uranium classified as 'waste ore' (i.e. less than 0.05% uranium) was used by Navajo in their homes to construct foundations, walls, fireplaces and chimneys. The waste ore was also used to build outdoor bread ovens, driveways and sheep corrals. The specially determined that:

a. The rock was taken from operating uranium mines of that day (i.e. about 1947 to 1960).

b. Gamma exposure readings range from 20 to 400 microroentgens per hour and that background is 10 to 15 microroentgens per hours. Comparison to Radiological Guidelines developed by Environmental Protection Commission for the Grand Junction, Colorado Remedial Action Program indicates these leveals may be harmful.

c. Uranium miners live in 22 such houese; and 8 other areas of Navajo Tribal lands may also have this problem. The health of these residents requires additional medical investigation.

d. Houses built with that rock appear to be located within two miles of a uranium mine which is now abandoned.

e. State of Utah radiological personnel are investigating reports that houses in Moab, Utah may also have been constructed of waste ore.

This discovery adds a different fact to the problem of uranium miners andother individual exposed to the uranium process in that they are exposed twice, work and at homes. Such residents should be included in S.1865 since they too are the unwilling victims of radiation exposure.

There is no mention of survivors, heirs, widows or dependents in S. 1865. Without such a provision, it will be unnecessarily difficult to process or adminster S. 1865. Additionally Navajo culture has different concepts of extended family than other groups which makes it very important to clarify which dependents and family members are eligible.

In this connection, as well as in the judicial process. There are no provisions for court costs. Since many of the afflicted individuals are financially unable to assume costs to retain legal counsel or to pursue an appeal following an adverse court determination, such costs should be included in S.1865 and funds allocated for this purpose.

Section 4 of S. 1865, which establishes an Advisory Panel, may require additional thought and revision. The Advisory Panel Report to Congress as outlined in Section 4(f) does not appear to be an instrument which can assist the district ourt in its deliberations nor does Section (f) make it clear what Congress is to do with the report. How will dissenting scientific information/ data be handled by the Panel Report? Section 5 authorizes the Secretary of H.E.W. "to conduct a comprehensive assessment of adverse health effects resulting from the atomice weapons test program."

How will this assessment include uranium processing? If the assessment by the Secretary and the findings of the Advisory Panel Report should contradict each other, how will this be resolved?

During the April, 1980 hearing for S. 1865 that Senator Hatch expressed an interest in the availability of University of Utah medical and research facilities to support S. 1865. Indian Health Service units of DHEW currently providing medical services to Navajos be supplemented to provide medical assistance for S. 1865? medical care, we could urge that mobile medical units be equipped to provide appropriate medical services to the people whos health has been adversely affected by radiation.

Association on American Indian Affairs, Inc.

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(1953-1963)

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Mrs. Lucy F. Covington, *Vice President*
Everett R. Rhoades, M.D., *Vice President*
Mrs. Henry S. Forbes, *Secretary*
John Simon, *Treasurer*
Steven Unger, *Executive Director*

June 5, 1980

The Honorable Edward M. Kennedy
Chairman
Subcommittee on Health of the
Senate Committee on Labor
and Human Resources
United States Senate
Russell Senate Office Building
Room 431
Washington, D.C. 20510

RE: S. 1865 -- Proposed Radiation Exposure Compensation Act

Dear Senator Kennedy:

We are writing on behalf of this Association to suggest a perfecting amendment in the text of S. 1865, the proposed Radiation Exposure Compensation Act, which would "amend Title 28 of the United States Code to make the United States liable for damages . . . due to certain nuclear tests at the Nevada Test Site or employment in a uranium mine." Specifically, we urge that the State of Washington be added to the States listed in proposed new section 2681(a)(2) in order to cover individuals working in mines on the Spokane Indian Reservation during the designated period.

S. 1865 provides, in part, that an individual may be entitled to compensation from the United States if he can show that he worked in a uranium mine in Colorado, New Mexico, Arizona or Utah for at least one year between January 1, 1947 and October 31, 1961, and who after January 4, 1948, died from, has, or has had lung cancer, pulmonary fibrosis, or any other disease or illness identified by an Advisory Panel to be es-

tablished by the Act. We have determined, however, that there were uranium mines operating on Indian reservation lands outside of the designated States during the critical periods of time specified in the legislation. More particularly, the 1979 United States Geological Survey Report on mineral excavation on federal Indian lands indicates that two uranium mines were operating on the Spokane Indian Reservation in the State of Washington from 1957 through 1964. The most productive mine was the "Midnite Mine," operated by the Dawn Corporation, with a total annual output of 1,172,410 tons of uranium. A less productive mine which operated on the reservation from 1958 through 1963, was the "Sherwood Mine," which produced an annual output of 305,700 tons of uranium ore.

We believe that the members of the Spokane Tribe and other individuals who worked for more than a year in the uranium mines on the Spokane Reservation should be entitled to the same benefits under the proposed legislation as the residents of other States. As noted at the beginning of this letter, therefore, we recommend that Washington be added to the States listed in new section 2681(a)(2) of Title 28.

We would appreciate your making this letter a part of the June 10 hearing record on S. 1865.

Respectfully submitted,

Arthur Lazarus, Jr.
General Counsel
Association on American
Indian Affairs, Inc.

ALjr/dar

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GREGORY DE SOUSA

June 12, 1980

The Honorable Edward M. Kennedy, Chairman
Subcommittee on Health & Scientific Research
Committee on Human Resources
United States Senate
Washington, D.C. 20510

Re: S. 1865

Dear Mr. Chairman:

I am writing on behalf of Ukpeagvik Inupiat Corporation (UIC), the Native village corporation of Barrow, Alaska. This corporation, representing over 2,000 Eskimo shareholders, was created pursuant to §8 of the Alaska Native Claims Settlement Act.

Enclosed is the statement of Theresa Pederson as well as a number of attachments. I would request that this letter, Ms. Pederson's statement and the attachments be included in the hearing record on S. 1865.

The statement and supporting materials clearly document the fact that the Eskimo population of northern Alaska has been seriously and adversely affected by nuclear fallout resulting from the United States' atmospheric weapons testing program conducted during the 1950's and early 1960's. Numerous scientific studies have concluded that as a result of fallout contamination of the fragile Arctic food chain, Eskimos have evidenced a dramatically higher body burden of dangerous radionuclides than any other segment of the American population.

We are presently collecting information on the incidence of various forms of cancer among the Eskimo population. As soon as this information is made available to us, we will provide it to the Subcommittee.

In the meantime, however, we believe that the attached information will be of interest to the Subcommittee. We would ask that, at such time as the Subcommittee acts on the legislation, it will take into account the interest of Alaskan Eskimos and that it will fashion a compensation program which protects those interests.

If you have any questions about the enclosures, I will be pleased to provide you with any additional information you may need.

Sincerely yours,

ABOUREZK, SHACK & MENDENHALL, P.C.

Glenn M. Feldman

Enclosures

STATEMENT

OF

THERESA PEDERSON

RESEARCHER

DELEGATE, INUIT CIRCUMPOLAR CONFERENCE
BOARD MEMBER, COUNCIL NATIVE CORPORATION

on behalf of

INUIT CIRCUMPOLAR COMMITTEE and
UKPEAGVIK INUPIAT CORPORATION, BARROW, ALASKA

before the

HEALTH AND SCIENTIFIC RESEARCH SUBCOMMITTEE
COMMITTEE ON HUMAN RESOURCES
UNITED STATES SENATE

on

S. 1865

"RADIATION EXPOSURE COMPENSATION ACT OF 1979"

June 10, 1980

Mr. Chairman and Members of the Subcommittee:

I appreciate having the opportunity to submit this statement and the attached materials which relate to S. 1865, the Radiation Exposure Compensation Act of 1980.

I understand, and support, the need for the United States to compensate those persons who have suffered injury as a result of government-sponsored atmospheric nuclear testing. To date, most of the attention has been focused primarily on those persons who lived or worked near the Nevada test site during the test period. I wish to call to the Subcommittee's attention another group of persons who, although residing far from the test site itself, have suffered substantial and well-documented injury as a direct result of our atmospheric testing program. I refer to the Eskimo (Inupiat) population of northern Alaska.

The quantity of radioactive fallout reaching the North Slope of Alaska as a result of U.S. atmospheric weapons tests was about one-fifth the amount observed at lower latitudes. However, the unique Arctic ecosystem coupled with the subsistence lifestyle of the Eskimo population has resulted in a situation in which the fallout radionuclides moved directly into the lichen-caribou-man food chain. The results show significantly higher strontium and cesium body burdens among Alaskan Eskimos than amongst any other population of U.S. citizens. These facts were documented and accepted by the Federal Radiation Council as long ago as 1965. Those federal findings are attached as a part of this statement. I have also attached a number of scientific studies which support these same conclusions.

I would also like to call to the attention of the Subcommittee the findings of independent research conducted in the Arctic environment by the Stockholm International Peace Research Institute (SIPRI):

> Radioactive contamination of arctic regions is almost entirely of military origin and needs to be singled out because of special problems associated with this habitat. Some fraction of this pollution has been the result of readily identifiable local testing and other incidents, but most has arrived as stratospheric fallout usually originating from distant sub-arctic nuclear weapon testing. Radioactive fallout onto arctic tundra is held especially well and long by the lichen flora that forms such an important component of the diet of caribou or reindeer, particularly in winter. Strontium-90 and cesium-137 are among the radioactive nuclides that are transferred to these animals as a result. In turn the animals constitute part of the diet of the indigenous humans, especially of Eskimos and Lapps leading traditional lives. The result of this short and pernicious food-chain has been that many of the native peoples of far northern North America and Eurasia have been subjected to body-burdens of these biologically-dangerous nuclides far in excess of any other populations of the world, exclusive of the residents of Hiroshima and Nagaskai of August 1945.
>
> + 1978 SIPRI Yearbook +

Scientific investigations into the dangers of radioactive fallout onto and up the arctic foodchain have linked a high per capita rate of various cancers among the Eskimos due to the absorption of highly concentrated radionuclides (i.e., strontium 89, strontium 90, cesium 137, iodine 131, iron 55 etc.). These radionuclides are the by-products of U.S. atmospheric nuclear tests. Studies on the transfer of transuranium nuclides along the foodchains have shown this activity to have latency periods longer than previously expected. However, during the past twelve years studies on this matter have been cut off and medical facilities in villages have been discontinued.

The distribution of fallout plutonium 238, 239, 240 and above stated nuclides have ranged from the liver, lungs, stomach, kidney, bones and reproductive organs of Eskimos, reindeer, caribou, moose, rabbits, foxes, wolverine, porcupines migratory birds, rodents, fish and marine mammals. All concentrations in man are due to the consumption of Arctic wildlife, a necessary part of our subsistence lifestyle. Also, high amounts of Americium 241 have been found along the very same foodchain. The geographical distribution of these by-products start at 64° N. Latitude continuing further north with high concentrations also existing among other Eskimos who live along the coastline who engage in extensive trading of foodstuffs with Eskimos from the far northern points. The absorbability of proteinbound plutonium in northern Alaska are significantly higher than the standards set by the International Commission on Radiation Protection.

It is increasingly evident that some cancers, particularly bone cancer, have a very low induction dose level. Among the Eskimo, U.S. researchers have found that such levels were reached and exceeded in the case of caribou-consuming Eskimos where the diet contains little calcium and large amounts of bone marrow, highly prized as a delicacy in our culture. The Eskimos believe the evidence demonstrating that peak cancer rates are not reached 30 years after the irradiation, and that bone cancer can occur at least 40 years after irradiation.

The Eskimos strongly desire the right to determine and participate in our own health care and would ask that the best possible medical care be made available in all Eskimo communities. As a part of that goal, we endorse the establishment of a clinic and research center to treat and investigate human health problems

which are fallout-related.

We recognize that the ecosystem in the Alaskan arctic is not the domain for any deliberate polluting practices by the U.S. This ecosystem has a higher dignity to us as a living place, shared with animals as a subsistence right. The environmental influences of nuclear applications by the U.S. have had significant reawakenings in the North. The lethal radioactivity carried by stratospheric air currents well beyond the immediate testing areas is taking its toll in the Alaskan sub-arctic and arctic regions. The indications are stonger now that a significantly higher proportion of mammalian reproduction, when exposed to radiation, have developed into many forms of cancer. With these circumstances, it would be practicing genocide by the super-nuclear power to ignore this biophysical situation regarding the arctic foodchain and the Eskimo.

In summary, we would ask that the Subcommittee amend S. 1865 to provide that the Eskimo population of northern Alaska which has either contracted or died from one of the forms of cancer associated with nuclear fallout be explicitly recognized as coming within the provisions of this legislation.

As an alternative, we would suggest that proposed sections 2681(e)(1)(B) be amended to read:

> "(B) Any other area of the United States determined by the Secretary of Health, Education & Welfare to have received a high level of fallout, or in which the human population has been otherwise significantly affected by fallout, as a result of ...."

As previously indicated, the quantitive amount of fallout reaching the Arctic environment was not as great as many other areas of the United States. Thus, as drafted, the language of that section might be read to preclude the Secretary from

determining that the Arctic is an "affected area" because it did not receive "a high level of fallout ...." This proposed amendment would ensure that the Secretary could take into account its actual affect on human health, as well as the absolute amount of fallout, reaching the Arctic.

We believe that the record clearly establishes that the Inupiat people have suffered grievious health problems caused by our government's atmospheric weapons testing program. If a compensation program for its victims is established, and we hope that one will be, we would urgently ask that the Eskimo population of northern Alaska be recognized and included.

Arctic Research Laboratory
Barrow, Alaska

REPORT NO. 7

background material for the development of radiation protection standards

protective action guides for strontium-89, strontium-90 and cesium-137

MAY 1965

Staff Report of the
FEDERAL RADIATION COUNCIL

Cesium-137 and Strontium-90 in Arctic Alaska

4.7 Although the amount of fallout deposited per unit area in the Arctic is about one-fifth that deposited in 30° - 40° latitude band, a combination of ecological conditions and specific dietary habits of the Eskimos and Indians result in higher strontium and cesium body burdens than are found in the conterminous United States. The lichen-caribou (reindeer)-man pathway is the most important food chain contributing to these body burdens.

4.8 Lichens accumulate nutrients and certain other materials which are deposited directly on them from the air. Their growth is slow and they tenaciously retain the fallout materials to which they are exposed. The concentrations of cesium-137 and strontium-90 in lichens are among the highest in plant life measured anywhere in the world. These radionuclides also tend to accumulate in other persistent vegetation, such as sphagnum moss and the crowns of sedge.

4.9 Lichens are important in the diet of caribou and reindeer, particularly during the winter. Other plants such as sedges are also consumed by these animals. This diet leads to relatively high concentrations of cesium-137 and strontium-90 in the meat of these animals. High levels in the food chain can be expected to persist for several years in the arctic region. The individuals and small population groups with the highest body burdens of cesium-137 are those whose dietary preference is caribou meat. Average body burdens of cesium-137 in these inhabitants were about three times as high in 1964 as they were in 1962. People with more diversified diets have lower body burdens. In 1964 the annual dose to the Eskimos having the highest body burdens was slightly more than one-half the RPG of 3,000 nanocuries for whole body exposure of individuals in large population groups. Average doses for adults of the same village are less than one-third the RPG. Although the Federal Radiation Council did not set a specific RPG for cesium-137, in either Report No. 1 or No. 2, it did state in the Memorandum for the President (Federal Register, September 26, 1961): "The characteristics of cesium-137 lead to direct comparisons with whole body exposure for which recommendations by the Council have already been made." This implies that the RPG would be 0.5 rem* in a year to the whole body of individuals in the general population when the doses can be measured directly, or an average of 0.17 rem to a suitable sample of the population group, when direct measurement is not practicable.

*For the purposes of this report the units "rem" and "rad" are considered numerically equal.

Arctic Research Laboratory
Barrow, Alaska
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Barrow File
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FEDERAL RADIATION COUNCIL

RADIATION PROTECTION GUIDANCE FOR FEDERAL AGENCIES

Memorandum for the President

MAY 17, 1965.

Pursuant to Executive Order 10831 and Public Law 86-373, the Federal Radiation Council is transmitting recommendations for the approval of the President for guidance of Federal agencies in their radiation protection activities. The present recommendations are directed to guidance for protective actions affecting the normal production, processing, distribution, and use of food products for human consumption when such products are contaminated with strontium-89, strontium-90, or cesium-137. It is the intention of the Council to release the background material leading to these recommendations as Staff Report No. 7 when the recommendations are approved.

Background. The first two memorandums that provided guidance for Federal agencies in the conduct of their radiation protection activities were approved by the President on May 13, 1960, and September 20, 1961. These provided a general philosophy of radiation protection and the general principles of control based on the annual intake of radionuclides. The recommendations also provided the basis for the control and regulation of normal peacetime operations in which exposure to radiation is a factor. The Radiation Protection Guides (RPG's) were designed to limit the exposures of the whole body and of certain organs of radiation workers and the general population resulting from the use of ionizing radiation in normal peacetime operations.

During the atmospheric testing of nuclear weapons in 1961 and 1962 the question arose as to the use of those RPG's for determining the conditions under which the production, processing, distribution, and use of food, particularly fresh fluid milk, should be altered to reduce human intake of radionuclides from fallout. In September 1962 the Federal Radiation Council stated its position on this subject, and in 1963 the Council reiterated that those existing guides were not applicable to a determination of a need for protective actions and noted that it would recommend guidance on the subject to the President.

Specific guidance for protective actions applicable to contamination of food by Iodine-131 was approved by the President in July 1964.

Data on worldwide fallout from past testing of nuclear weapons in the atmosphere have been reviewed by the Federal Radiation Council and the findings reported in FRC Report Nos. 2, 4, and 6.

Fundamental differences between Radiation Protection Guides and Protective Action Guides. FRC Report Nos. 1 and 2 provide radiation protection guidance for the control and regulation of the normal peacetime uses of nuclear technology in which control is exercised primarily on the design and use of the radiation source. The RPG's in those reports were developed as guidelines for the protection of radiation workers and the general public against exposures that might result from routine uses of ionizing radiation.

In formulating these guides there was a judgment, or balance, between the possible risks associated with a particular radiation exposure and the reasons for allowing the exposure.

An important factor in providing guides for any purpose is the change in risk assigned to his/her or lower doses and the corresponding effort to reduce them. Other factors influencing informed opinion of where and why a particular balance should be made include views regarding prevailing practices and the relative importance of health risks in relation to economic, political, or other considerations of national welfare.

Although radiation doses numerically equal to the RPG's may impose a risk so small that they can be accepted each year for a lifetime if there is significant benefit from the programs causing the exposure, they do not and cannot establish a line that is safe on one side and unsafe on the other. Rather, some risk of injury may exist at any level of dose and the risk continuously increases with dose. Caution should be exercised in decisions to take protective actions in situations where projected doses are near the numerical values of the RPG's since the biological risks are so low that the actions could have a net adverse rather than beneficial effect on the public well-being.

In contrast to the guidance for control at the point of release, FRC Report No. 5 provided general guidance for the protection of the population against exposure resulting from the accidental release, or to the unforeseen appearance, of radioactive materials in the environment. Specific guidance, including a numerical value for the Protective Action Guide (PAG) was provided for Iodine-131. The PAG represents a consensus as to when, under the conditions considered most likely to occur, intervention is indicated to avoid radiation exposure that would otherwise result from a transient environmental contamination condition. This judgment involves health, economic, sociologic, and political factors for which the relative values are different than for the RPG. These factors for the PAG may include agricultural policies, the known feasibility of protective actions, related health impacts, and similar considerations involved in the national interest.

Radionuclides considered. Four radionuclides are particularly important in considering radioactive contamination of food. These are Iodine-131, strontium-89, strontium-90, and cesium-137. Iodine-131 was considered in FRC Report No. 5, and this memorandum will deal only with strontium-89, strontium-90, and cesium-137.

Physical and biological factors related to the metabolism of strontium and cesium have recently been reviewed for the Federal Radiation Council by a committee selected by the National Academy of Sciences. Consideration has been given to the irradiation of the embryo or fetus by these nuclides, as well as irradiation of infants, children, and adults. Irradiation of bone marrow is considered to be the most significant from the standpoint of producing harmful effects. Strontium-89 and strontium-90 deposit selectively in the skeleton causing irradiation of bone marrow adjacent to the sites of deposition in the skeleton. Cesium-137 is distributed through soft tissues and irradiates the whole body, including bone and bone marrow.

Protective Actions Guides. As stated in Report No. 5, a protective action is an action or measure taken to avoid most of the exposure to radiation that would occur from future ingestion of the foods contaminated with radioactive materials.

Decisions to implement protective actions involve a comparison of the risk due to radiation exposure with the undesirable features of the contemplated actions. The critical decisions to be made are whether to permit unrestricted use of feed crops or food products, to place restrictions on the normal use of feed crops or food products, or to destroy feed crops or food products.

The Council has adopted the term Protective Action Guide, defined as the projected absorbed dose to individuals in the general population that warrants protective action following a contaminating event. The projected dose is the dose that would be received by individuals in the population group from the contaminating event if no protective action were taken. If the projected dose exceeds the PAG, protective action is indicated. Making use of the operational technique adopted in the Memorandum for the President, May 1960, protective action would be indicated at an average projected dose to a suitable sample of the exposed population equal to one-third of the PAG.

Protective actions are appropriate when the health benefits associated with the reduction in exposure to be achieved are sufficient to offset the undesirable features of the protective actions. The PAG represents the Council's judgment as to where this balance should be for the conditions considered most likely to occur. If, in a particular situation, there is available an effective action with low total impact, initiation of such action at a projected dose lower than the PAG may be justifiable. If only high impact action would be effective, initiation of such action may be justifiable only at a projected dose higher than the PAG. The types of actions considered in the development of guidance in the memorandum include:

1. Altering production, processing, or distribution practices affecting the movement of radioactive contamination through the food chain and into the human body. This action may include storage of food supplies and animal feeds to allow for radioactive decay.

2. Diverting affected products to uses other than human consumption.

3. Condemning affected products.

An alteration of the normal diet of an individual is generally less desirable than the measures listed and should not be undertaken except on the personal advice of a physician.

Two limiting conditions of environmental contamination have been examined: an acute localized contaminating event in which prompt action may be necessary to avoid the exposure that would otherwise result; and a widespread, generally increasing, low-level contamination (from stratospheric fallout) that would cause a continuous intake of radionuclides by large numbers of people for several years.

The acute localized contaminating event. Situations justifying protective actions could occur from such events as an industrial accident, possibly involving a nuclear reactor or a nuclear fuel processing plant, and release of radioactive materials from nuclear explosions. The considerations involved in determining appropriate criteria for protective action have led to the development of three categories of dietary pathways which may require decisions following an acute contaminating event. Categories I and II related to intake in the first year following acute deposition, while Category III considers subsequent intake after the first year.

Category I is concerned with the immediate transmission of the radionuclides through the pasture-cow-milk-man pathway. The three nuclides of interest may be transmitted through this pathway simultaneously if they are deposited simultaneously on pasture. Experimental data indicate that nearly all the radioactivity appearing in milk through this pathway will have occurred within 100 days, and protective actions may have to be applied for this length of time. Protective action must be initiated within about a week to be effective in averting most of the potential exposure. This category of transmission may be the only one of importance for strontium-89 because of its relatively short radioactive half life (50.5 days).

Category II is concerned with the transmission of radionuclides to man through dietary pathways other than that specified as Category I during the first year following an acute contaminating event. This involves the use of feed crops for animals, including dairy cattle, and plant products used directly for human consumption. The radioactivity initially deposited on such crops or the field does not gain access to the human food chain until after the crops are harvested. Immediate action to reduce the potential intake will not usually be required because of the normal delay in the use of such crops. However, an early decision will be required as to the need for examination of the radionuclide content of harvested crops before they enter normal marketing channels. Strontium-90 and cesium-137 may be transmitted through the cow's feed to milk; cesium-137, in particular, may be transmitted through feed to meat; both may be transmitted to man through the direct consumption of plant products.

Category III is primarily concerned with the long-term transmission of strontium-90 through soil into plants in the years following a contaminating event. Residual contamination of cesium-137 on pasture when there is a heavy root mat may be a consideration for 1 to 2 years following a sufficiently severe contaminating event. Because of the long leadtime available to assess the possible radionuclide intakes, immediate action is not necessary. Any action that may be taken must be based on the long-term reduction of the radionuclide concentrations in products grown in the area.

In considering the desirability of initiating protective actions following a contaminating event, it is necessary to consider the three categories separately. The benefits of a protective action taken in one category are largely independent of whether or not action is taken in another. Individuals may be exposed to radioactivity from all three categories; however, the guides for individual categories recommended in this memorandum are sufficiently conservative that it is unnecessary to provide an additional limitation on combined doses. Since actions that are likely to be taken in Categories I and II would be effective against any of the three nuclides in either category, the sum of the projected doses to the bone marrow should be compared to the numerical value of the respective guide in the appropriate category when the need for protective action is considered.

Considerations in the development of Protective Actions. The basic considerations in the development of guidance for the acute event are:

1. The occurrence of an acute contaminating event which will require protective action is considered to be so infrequent that it is unlikely that the same individual will be exposed to more than one event.

2. Exposure to the public from radionuclides in the environment is directly related to concentration of the radionuclides in food supplies and the length of time (weeks, months, or years) over which unusual exposures would be expected to occur. The need for protective actions is generally independent of the source of contamination.

3. The substitution of food or feeds of lower radionuclide content for contaminated products is both effective and practicable.

4. The potential intake of radionuclides by individuals in the general public from radionuclides in the environment can be reduced whenever modifications in the normal production, processing, distribution, or dietary practices are considered to be less objectionable than the radiation risk that would otherwise have to be accepted.

5. Protective actions, by their very nature, are short-term modifications in such practices.

6. If the contamination of a particular crop or dietary component is so high that it would not be acceptable for local use, the crop or dietary component is not considered acceptable for use in other areas to which it may be transported.

SPECIFIC GUIDANCE

Category I. The concept of the PAG, as presented in Report No. 5, was developed for use as guidance in situations involving the rapid transmission of radionuclides from pasture to milk to man with inherent limitations on the types of effective actions for which the necessary resources would be generally available. Such a situation has many of the characteristics of an emergency requiring an immediate decision as to the need for protective actions. The possible need for early actions to avoid most of the projected intake that may result from an acute localized contaminating event involving strontium-89, strontium-90, and cesium-137 is also present in Category I.

Recommendation. In view of these considerations it is recommended that:

1. The Protective Action Guide for the transmission of strontium-89, strontium-90, and cesium-137 through milk under the conditions of Category I be a mean dose of 10 rads in the first year to the bone marrow or whole body of individuals in the general population; and provided further that the total dose resulting from Category I not exceed 15 rads. For purposes of applying this guide, the total dose from strontium-89 and cesium-137 is assumed to be the same as the dose in the first year, whereas the total dose from strontium-90 is assumed to be five times the dose from strontium-90 in the first year. As an operational technique it is assumed that the guide will be met effectively if the average projected dose to a suitable sample of the population (children approximately 1 year of age) does not exceed one-third of the numerical values prescribed for the individual.

Category II. The time of deposition of radioactive materials relative to the various stages in the plant growth cycle will be a major factor affecting the concentration of radionuclides in food and feed. Although the variations in these concentrations can be large, depending on the time of year and the particular produce grown in the contaminated area, the concentrations of radionuclides reaching man through Category II pathways will be less, in most cases, than those in Category I. The need for initiating a program to assess the radionuclide content and the use of crops in Category II can be deduced from the situation found in Category I. Protective actions usually will not be required in Category II if they were not required in Category I.

When a need for quantitative examination of crops has been established the significance of radioactive contamination should be evaluated in terms of potential daily intake by persons deriving major portions of their diets from local foods. Within Category II a wide range of situations may exist. It is generally impossible to predict total radiation doses solely from the degree of contamination of a particular crop. The composition of population groups consuming food crops in Category II usually will differ from the composition of groups affected by Category I. The complexity of such situations and the fact that, for most crops, immediate action beyond assuring that questionable crops are not marketed before appropriate assessment can be made, make it impractical to provide numerical guides ap-

plicable to individual products. However, if it appears that the total projected dose to a suitable sample of a population group from all crops in Category II would be larger than the PAG recommended for this category, protective actions should be initiated against those crops that would make major contributions to that dose. In order to meet the objective of Item No. 6 of the basic considerations in the development of this guidance, the suitable sample would be from a group considered to live in a contaminated area and also be considered to make maximum utilization of locally produced food products.

Recommendation. In view of these considerations it is recommended that:

2. The Protective Action Guide for the transmission of strontium-89, strontium-90, and cesium-137 through food crops or animal feed crops under the conditions in Category II be a mean dose of five rads in the first year to the bone marrow or whole body of individuals in the general population. As an operational technique it is assumed that the guide will be met effectively if the average projected dose to a suitable sample of the local population is no larger than two rads in the first year to the whole body or bone marrow.

Category III. In this category there can be extremely wide variations in the situations that might exist in relation to (1) areas involved, (2) crops affected, (3) possible rate of change in strontium-90 gaining access to plants, and (4) possible actions. In addition, one is now concerned with problems of long-term chronic exposure. Actions that may be effective in Category III involve major long-term changes in farming practices such as selection of crops, chemical or mechanical treatment of soil, land utilization, or all three of these. Following a sufficiently severe event, long-term restrictions may be placed on the use of farmland for food or feed production. The range of considerations that may enter into a decision to take action in this category together with the length of time available for detailed evaluations make it less meaningful to provide a numerical PAG than to provide guidance for evaluation of long-term situations. The nature of the situation is such that detailed evaluation would not be required except in situations in which levels of environmental contamination are greater than those that might occur under guidance provided for normal peacetime operations.

Recommendations. In view of these considerations it is recommended that:

3. The desirability of protective action against exposure to environmental radioactivity from situations in Category III be determined on a case-by-case basis. If it appears that annual doses to the bone marrow after the first year may exceed 0.5 rad to individuals or 0.2 rad to a suitable sample of the population such situations shall be appropriately evaluated.

It is recommended that:

4. The guidance contained in the preceding recommendations be approved for use of Federal agencies in the conduct of those radiation protection activities affecting the normal production, processing, distribution, and use of food and agricultural products following acute radioactive contamination of the environment.

The numerical values of absorbed doses specified as guides for an acute contaminating event are not intended to authorize deliberate releases expected to result in absorbed doses of these magnitudes, nor do they have any relevance to civil defense applications.

Worldwide contamination from stratospheric fallout. Stratospheric fallout from past atmospheric testing of nuclear weapons has led to a worldwide deposition of fission products in the environment. The studies of fallout in the United States from past testing (FRC Report Nos. 4 and 6) have indicated that:

1. In the conterminous United States strontium-89 gave estimated average total doses of 0.04 rad to bone and 0.01 rad to bone marrow. These doses were divided about equally between 1962 and 1963. In 1964 the estimated dose from strontium-89 was negligible.

2. The average annual strontium-90 content of the total diet in the "wet" areas of the United States reached a value of approximately 40 picocuries of strontium-90 per gram calcium in 1964. This could lead to an average annual dose in new bone and in bone marrow of about 0.03 and 0.01 rad, respectively. In Alaska strontium-90 burdens in bone of a few individuals appear to be about four times as high as those found in the conterminous United States.

3. Internal exposure from cesium-137 to be taken in through the diet in the conterminous United States during the next 30 years has been estimated to be about 0.01 rad. In Alaska, although the amount of fallout deposited per unit area is about one-fifth as much as that deposited in the 30°–40° latitude band, a combination of ecological conditions and specific dietary habits of some Eskimos and Indians causes higher cesium body burdens than are found in the conterminous United States. Average body burdens of cesium-137 in these inhabitants were about three times as high in 1964 as they were in 1962. The estimated annual whole body doses to these individuals ranged from about one-quarter to one-half of the numerical value of the RPG for individuals in the general population.

On the basis of this information on stratospheric fallout the Council concluded that the health risk from radioactivity in food over the next several years would be too small to justify protective actions to limit the intake of radionuclides either by diet modifications or by altering the normal distribution and use of food, particularly milk and dairy products.

Recommendations. In view of these considerations it is recommended that:

5. Surveillance of the radionuclide content in food products contaminated with worldwide fallout be continued at levels appropriate to the situation.

It is recommended that:

6. Surveillance and research programs examining the special ecological situations in the arctic region continue until future trends can be predicted with greater confidence.

It is recommended that:

7. Nationwide programs to reduce potential exposure of the population from gradually increasing levels of environmental contamination, such as that associated with worldwide fallout, are not necessary now nor for future levels of fallout from past testing.

ANTHONY J. CELEBREZZE,
Chairman.

The recommendations numbered "1" through "7" contained in the above memorandum are approved for the guidance of Federal agencies, and the memorandum shall be published in the FEDERAL REGISTER.

Dated: May 20, 1965.

LYNDON B. JOHNSON.

[F.R. Doc. 65-5476; Filed, May 21, 1965; 12:00 m.]

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CESIUM-137 IN ALASKAN LICHENS, CARIBOU AND ESKIMOS*†

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(*Received* 28 *June* 1966; *in revised form* 12 *September* 1966)

Abstract—Cesium-137 concentrations in Alaskan arctic ecosystem components during the period 1962–1965 varied with seasonal and environmental conditions, emphasizing the important influence of ecologic factors upon fallout accumulation in the lichen–caribou(reindeer)–man food chain.

Concentrations in lichens at Anaktuvuk Pass, Alaska increased with time and varied among several species. Caribou flesh contained maximum ^{137}Cs levels during winter periods and lowest values during summer months corresponding to lichen utilization. Body burdens in natives utilizing the caribou as a food base reflected the ^{137}Cs cycle in caribou flesh, but lagged by a few months. Maximum values occurred during summer and minimum values were found during mid-winter.

Biological half-time of ^{137}Cs was estimated to be about 13 years in lichens by measuring retention of ^{134}Cs artificially applied to natural lichen communities, three to five weeks in caribou and about 65 days in Eskimos.

Cesium-137 concentrations increased by about a factor of two at each successive trophic level of the food chain. The trend with time was one of steady increase, although unusual variations occurred during 1964 and 1965 and were believed to be associated with caribou migration patterns. Recent data suggest ^{137}Cs body burdens of the Anaktuvuk Pass Eskimos will continue to increase during the summer of 1966 in contrast to the downward trend reported in Scandinavia.

Cesium-137 is generally recognized as a most important constituent of worldwide radioactive fallout resulting from nuclear weapons tests. Its importance is nowhere greater than in the arctic and subarctic regions of the northern hemisphere, where the unique features of the lichen–caribou (reindeer)–man food chain have created a situation of increasing interest to workers in the fields of radiation ecology and radiological health.

Our radiation ecology studies in Alaska began in 1959 and have progressed from a description of the general spectra of fallout radionuclides in arctic biota to a definition of seasonal cycles, rates and routes of radionuclide movement within the ecosystems, with particular attention to ^{90}Sr and ^{137}Cs. Cesium-137 has been of greatest importance in these studies, not only because of its public health aspects, but also because its convenient gamma emission and biological concentration permits effective study of its transfer within the natural systems. The results of these studies and those of other northern regions have been remarkably consistent. The ^{137}Cs situation in the arctic regions may be briefly described as depending upon (1) the extremely effective retention of ^{137}Cs by lichens, (2) the importance of lichens as a winter food for caribou and reindeer, and (3) the dependence upon caribou and reindeer for food by many northern peoples.

The transfer of ^{137}Cs up the food chain in this series of steps or stages, known as trophic levels, illustrates the simple and thus delicately balanced structure of arctic ecosystems.

* This paper is based on work performed under United States Atomic Energy Commission Contract AT(45-1)-1830.

† Presented at the Annual Meeting of the Health Physics Society at Houston, Texas on June 27–30, 1966.

CESIUM-137 IN LICHENS

It is apparent that lichens represents a most important reservoir of ^{137}Cs and other fallout radionuclides because of their longevity (decades, even one century), persistence of aerial parts, and their dependence upon nutrients dissolved in precipitation.[1] These properties result in a tenacious holding of ^{137}Cs. Recent field experiments in Alaska utilizing ^{134}Cs as a tracer suggest a biological half-time of about 13 years for cesium in lichens.[2] This value is median to half-time estimates of 17 years[3] and 6–10 years[4] obtained by comparison of changes in ^{137}Cs levels in lichens and ^{137}Cs deposition in northern Scandinavia.

Further evidence recently reported[10] showed that ^{137}Cs applied to the green living top part of lichens remained there rather than being translocated throughout the plant, as was ^{90}Sr. The continuing long-term accumulation of ^{137}Cs in Alaskan lichens is shown in Fig. 1, which illustrates that concentrations of other fallout radionuclides ^{54}Mn, ^{95}Nr, ^{106}Ru and ^{144}Ce have decreased since early 1961, particularly during periods of snow cover when the lichens were shielded from direct fallout deposition. A comparison of ^{137}Cs concentrations in eight lichen species suggests that ^{137}Cs levels tend to be ranked according to a species' ecological "niche", structural diversity and growth pattern. This is illustrated here by three examples (Fig. 2). Highest concentrations occur in *Cornicularia divergens*, which grows on windswept ridgetops that are nearly free of snow during winter and are first snow-free in the spring; intermediate levels were found in *Cetraria cucullata* collected from the sides of the ridges and which were covered by an average of 5 cm of snow for about

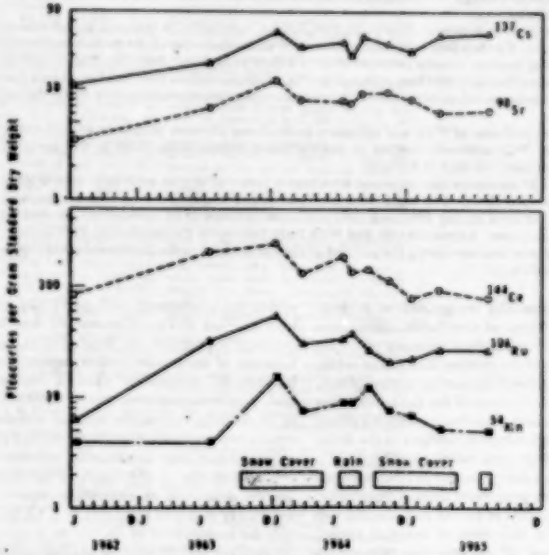

FIG. 1. Concentrations of ^{54}Mn, ^{90}Sr, ^{106}Ru, ^{137}Cs and ^{144}Ce in *Cladonia-Cetraria* lichens at Anaktuvuk Pass, Alaska during 1962–1965.

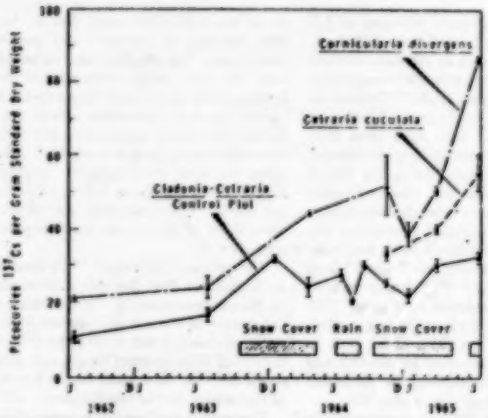

FIG. 2. Cesium-137 concentrations in three lichen sample types at Anaktuvuk Pass, Alaska during 1962–1965. Values shown are mean ± one standard error.

6 months each year, and least amounts were in mixed *Cladonia-Cetraria* samples which were snow-covered to a depth of 2–3 dm during winter.

The quantities of fallout ^{137}Cs per square meter of *Cladonia-Cetraria* lichens at a site in Anaktuvuk Pass, Alaska during the month of July of the years 1962–1965 were 18, 28, 41, and 48 nCi, respectively. These values are nearly identical to those reported from northern Sweden[3] at comparable times and are slightly greater than cumulative ^{137}Cs fallout estimates obtained from HASL soil and precipitation samples from other Alaskan locations.[6,7] These data reinforce other observations that lichen mats are efficient accumulators of fallout and may well serve as natural fallout meters.[3]

CESIUM-137 IN CARIBOU AND REINDEER

The heavy utilization of lichens by caribou and reindeer as a basic winter food results in the rapid accumulation of ^{137}Cs levels in flesh to levels that exceed those of other arctic herbivores.

Within any one herd of Alaskan caribou there has usually been a coefficient of variation of about 30 per cent in concentrations of ^{137}Cs.[9] Finnish investigators have recently reported greater variability among ^{137}Cs concentrations in male reindeer flesh compared to females due to physiological parameters.[12] Controlled metabolic studies of orally administered ^{137}Cs in reindeer suggest that muscle physiological activity may influence accumulation and distribution.[10]

Caribou and reindeer samples collected from several locations in northern Alaska suggest that animals from the Noatak and Kobuk River drainages may contain higher ^{137}Cs concentrations that do animals from other locations, although it is difficult to characterize ^{137}Cs concentrations among the several caribou and reindeer herds in Alaska because of the extensive migrations of the animals and large area involved. There is, however, a definite seasonal cycle of ^{137}Cs concentrations in caribou and reindeer, with maximum values during the winter period when lichens are their main food and minima during the summer pasturing period.[1,4,5,11,12]

The rapid decrease of flesh ^{137}Cs concentrations with the shift to summer diets, as well as other experimental data, indicates a biological half-time of about 3–5 weeks in caribou and reindeer. Recent experiments in the USSR have been cited[13] in which 50 per cent of the ^{137}Cs

body burden had a biological half-time of 1.5 days and 50 per cent had a half-time of 20 days. Thus, ^{137}Cs concentrations in Alaskan caribou flesh often have varied over a threefold range from winter high to summer low, while ^{137}Cs levels in lichens were essentially unchanged. Maximum ^{137}Cs values in caribou flesh have been consistently associated with animal samples obtained during April or early May (the spring kill of animals migrating from the winter range). These values usually have been slightly greater than those in caribou collected throughout the winter period near Anaktuvuk Pass, and may represent animals moving northward from ranges containing greater ^{137}Cs concentrations than those of the Anaktuvuk Pass area. The ratio of summer range:winter range caribou flesh values generally has been about 1:3 to 1:10, and is near that reported in Swedish and Russian reindeer herds individually identified and related to their respective ranges.[3,5]

A sharp increase of ^{137}Cs concentrations in caribou flesh sampled during April and May was apparent in 1964 and 1965, and emphasized the possible importance of caribou migration patterns in regulating the ^{137}Cs body burdens in Anaktuvuk Pass Eskimos. These spring-killed animals are the main food source during the summer months when few other game animals are available. Although we have no conclusive proof the increases were due to sampling of animals from distant ranges, we assume they were associated with the caribou migration patterns.

CESIUM-137 IN ESKIMOS

The dependence upon wildlife and other natural resources for substantial amounts of food results in major differences in seasonal and geographic utilization of animals in various villages.[12,13] These differences appear to control the ^{137}Cs levels in the natives, as shown by our initial surveys of radionuclides in northern Alaskan natives and their foods.[14,15,16] In general, there was a linear relationship between reported caribou or reindeer consumption and the ^{137}Cs body burdens. The higher levels usually have been found at the inland village at Anaktuvuk Pass. These people have a very limited economic base and are thus more dependent upon their own resources than other native Alaskan villages. Caribou meat forms about one-half of the total diet at Anaktuvuk Pass, because of necessity and preference to other foods. The Anaktuvuk Pass people represent the last major remnant of nunamiut Eskimos that were formerly nomadic and now remain at their mountain village site. Their culture has always centered on the caribou and the welfare of the people is still highly dependent upon the local environment. Average adults estimate they eat about 5–6 kg of caribou meat per week. Body burdens are about 50–100 times those of persons on an average temperate zone diet.

The seasonal pattern of ^{137}Cs concentrations in Anaktuvuk Pass Eskimos is inversely related to the concentration in the caribou because of the timing of the kill and the stockpiling practices. Animals killed during the fall season are returning from summer ranges and contain low levels of ^{137}Cs. This meat supply forms the base of the winter diet of the Eskimos.

The spring caribou kill is made during April and May as the animals migrate northward from their winter range, at which time they contain the highest ^{137}Cs concentrations of the cycle. This meat is stored in underground caches for use throughout the summer. Maximum ^{137}Cs levels in the Eskimos usually have occurred during July and August and minimums during January.

The relationship of the ^{137}Cs seasonal cycles in caribou, Eskimos and lichens is shown in Fig. 3. The graph of Eskimo body burdens prior to January 1964 and after August 1965 is drawn point-to-point and does not show seasonal variations defined by the bi-monthly measurements made during the period January 1964–August 1965. Comparison of ^{137}Cs body burdens from one summer to the next shows a pronounced increase of about 50 per cent from 1962 to 1963 and a doubling between 1963 and 1964, followed by a decrease of 30 per cent from 1964 to 1965. This is consistent with the pattern of ^{137}Cs concentrations in caribou flesh forming the food base of the people. But, ^{137}Cs concentrations in lichens, the main determinants of the level in caribou flesh, have shown a steady increase with time. Thus, the 30 per cent decrease from 1964 to 1965 was as inconsistent with the ^{137}Cs trend in lichens as was the abrupt increase during the spring of 1964 and emphasizes the probable

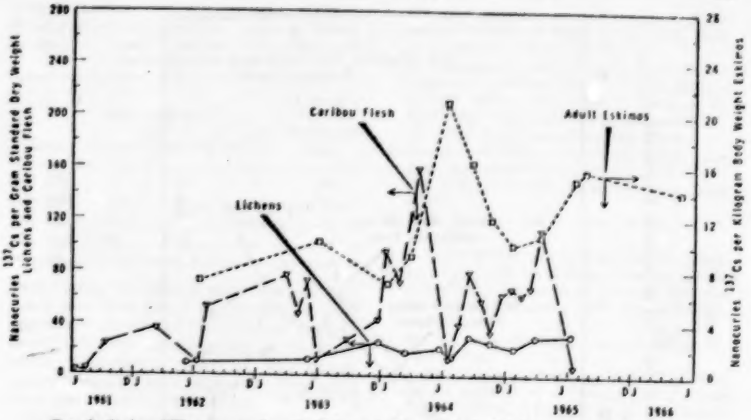

FIG. 3. Cesium-137 concentrations in lichens, caribou flesh and Eskimos at Anaktuvuk Pass, Alaska during 1961–1963.

importance of caribou migration patterns in the determination of ^{137}Cs levels in the Eskimos.

Adult males between the ages of 20 and 50 ordinarily have the highest body burdens of ^{137}Cs, apparently due to their greater proportion of muscle and greater consumption of caribou. Children (3–14 years old) usually contained about half as much ^{137}Cs per kilogram as adults (>21 years old). Minors (15–20 years old) contained about 70 per cent as much as adults. Comparison of males and females during the 1964 and 1965 seasonal maxima indicated no important differences in ^{137}Cs body burdens until about the age of 20, males then consistently contained more ^{137}Cs than did females, maximum differences occurred at about the age of 40, and the difference then decreased during advanced age.[17]

The biological half-time of ^{137}Cs in adult Eskimos at Anaktuvuk Pass during the summer of 1965 was about 65 days, comparable to that reported for other arctic peoples.[16,19,20,21] NEVSTRUEVA *et al.*[15] have reported that measurements of 60 reindeer breeders yielded biological half-times of 97 ± 50 days in summer and 57 ± 35 days in winter: but details of the study are not yet available to explain the differences.

Concentrations of ^{137}Cs in various arctic peoples in Finland, Norway, Sweden, the Soviet Union and Alaska are presented in Fig. 4. These data show that in the three countries where measurements have been performed regularly since 1962, the Finnish Lapps have consistently exhibited the highest values and Alaskan Eskimos have shown the lowest values until recent months. The Swedish investigators are presently defining the seasonal cycle of ^{137}Cs in their northern peoples by frequent counting begun during mid-1965, and initial results appear to follow the same general pattern observed in Alaska during 1964–1965. Values from the three countries were quite comparable during 1962 and 1963, and then diverged during 1964 and 1965. Now a decreasing trend has apparently begun in the Finnish and Swedish Lapps, while the Alaskan Eskimos continue to increase. This contrast may be explained by changes in reindeer herding practices in Scandinavian countries, that may result in the animals regrazing ranges where the top parts of the lichens containing the greater concentrations of ^{137}Cs have previously been removed. The Alaskan trend is consistent with the pattern of steadily increasing ^{137}Cs concentrations in

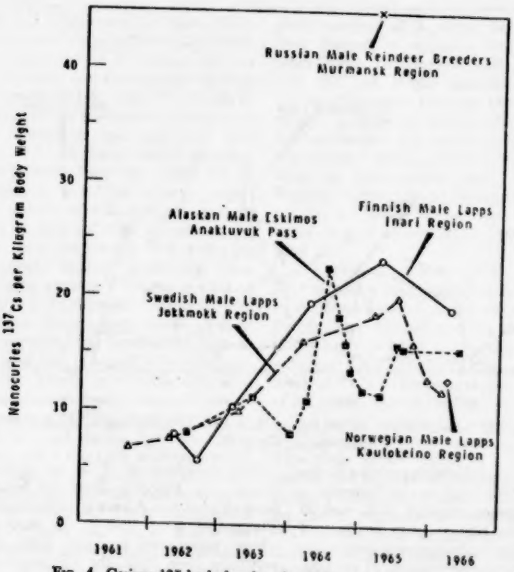

FIG. 4. Cesium-137 body burdens in northern human populations of Sweden,[3] Finland,[4] USSR,[5] Norway[22] and Alaska (U.S.A.) during 1961–1966.

lichens and caribou, which do not occupy such specific herd areas as do reindeer. The single points for Norwegian and Russian reindeer breeders have been included to provide reference to other northern populations.

Wolf flesh obtained from animals of the Anaktuvuk Pass region, presumably dependent upon caribou for their main diet during the period September–March, contained about twice the ^{137}Cs concentration in caribou flesh. Estimates of ^{137}Cs concentrations in Eskimo muscle were about the same as those for the caribou flesh used for food. Because about half the Eskimo's food was caribou meat, it is reasonable to assign a concentration factor of two to the caribou–carnivore (including man) link of the Alaskan food chain.

SUMMARY AND CONCLUSIONS

Studies of ^{137}Cs in arctic ecosystems have been conducted to provide information about transfer routes and rates of this important fallout radionuclide in a region where wildlife resources are necessary to human welfare. The lichen–caribou(reindeer)–man food chain has been observed to constitute an important ^{137}Cs concentration process. This results from (1) the unusual capacity of lichens to absorb and retain fallout materials, especially ^{137}Cs; (2) the utilization of lichens for food in winter by caribou and reindeer; and (3) the dependence upon caribou and reindeer for food by several northern populations. Although there are differences in radionuclide concentrations in plants and animals, including man, from various locations within the

Table 1. Cumulative ^{137}Cs fallout in Alaska (nCi/m²) derived from soil and precipitation samples at Barrow, Fairbanks and Palmer[6,7] and from lichens at Anaktuvuk Pass during 1962–1965

Date	Soil and Precipitation			Lichens
	Palmer	Fairbanks	Barrow	Anaktuvuk Pass
July 1962	23	20	8	18
July 1963	32	29	13	28
July 1964	38	33	16	41
July 1965	45	38	16	48

arctic region, the same general ecological processes have been found to efficiently transfer appreciable amounts of ^{137}Cs through the food chain. Climatic factors, animals behavior, food habits, physiological parameters and human cultural practices have important effects upon ^{137}Cs accumulation and retention.

Cesium-137 concentrations increased by a factor of about two at each successive trophic level of the Alaskan lichen–caribou–man(wolf) food chain. The trend with time is one of steady increase, and contrasts with a recent decrease of ^{137}Cs body burdens in Finland and Sweden. Recent measurements in Alaska suggest that ^{137}Cs whole body burdens will continue to increase during the summer of 1966.

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Current and Potential Hazardous Contamination of the Environment

Fallout Radionuclides in Northern Alaskan Ecosystems

Wayne C. Hanson, BS, Richland, Wash

Read about particles in 1962 in Canada discharged the young trees and filtered through the food chain.

THE CONCENTRATION of radioactive fallout within various components of arctic ecosystems has been extensively studied during recent years as a consequence of the transmission in significant amounts of certain radionuclides to human populations. This results from (1) the dependence of northern native peoples upon wildlife resources for much of their physical and economic well-being; (2) the relatively simple food webs involved; and (3) the presence of several radionuclides from natural and artificial sources during the past decade, especially following the 1961-1963 series of atmospheric nuclear weapons tests conducted by Britain, France, Russia, and the United States. Several of these artificial radionuclides are of only transitory interest due to one or more of the following reasons: (1) their short physical half-life rapidly removes them from the environment, as in the case of iodine 131 (^{131}I); (2) they exist in trace amounts often measurable only by intricate radiochemical methods; or (3) they are "biologically inactive." Studies of these radionuclides in Alaskan arctic ecosystems have been previously reported.[1-3] Major research and radiological health emphasis has focused on the two long-lived fallout components, strontium 90 (^{90}Sr) and cesium 137 (^{137}Cs). Long physical half-lives of 28 and 30 years, respectively, and other properties make them available over extended periods of time and provide the opportunity to study cycling properties in biologic systems.

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From the Biology Department, Battelle Memorial Institute, Pacific Northwest Laboratory, Richland, Wash.

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Much recent research has been devoted to the natural radiation environment of world populations, and notable in this category are the findings of significantly higher concentrations of lead 210 (^{210}Pb) and polonium 210 (^{210}Po) in northern ecosystems compared to temperate zone counterparts.[1-3] This condition has presumably existed for centuries and present data indicate that the deposition and transmission processes involved with these "natural fallout" radionuclides are much the same as those for ^{90}Sr and ^{137}Cs. The following discussion of our research into the routes, rates, and amounts of artificial fallout radionuclides in Alaskan arctic biota will therefore concentrate on ^{90}Sr and ^{137}Cs, with the implication that the results may apply widely to trace materials in northern environments.

Fallout Deposition in the Arctic

Although fallout deposition at 60 to 70° North latitude is but one fourth to one half that of the temperate regions,[9,10] the lichen-caribou (reindeer)-man food chain consistently yields high concentrations of most fallout radionuclides in man. In the case of ^{137}Cs, usually considered the most important from the standpoint of radiological health, body burdens in arctic native populations are often 50 to 100 times greater than those of temperate region peoples. In brief, this phenomenon is due to (1) the extremely effective retention of ^{137}Cs in lichens, (2) the importance of lichens as basic winter food of caribou and reindeer, and (3) the dependence upon caribou and reindeer for food by many northern peoples. Differences in the metabolic behavior of ^{90}Sr and ^{137}Cs account for the greater importance of ^{137}Cs under circumstances of the arctic food web. Being concentrated primarily in muscle and other soft tissues, ^{137}Cs is efficiently moved from one animal to the next; ^{90}Sr tends to be blocked from transfer by its concentration within the skeletal bone. Radiological health implications of these radionuclides are discussed later.

Fig 1.—Map of northwestern Alaska showing locations of native villages and whole-body counting locations.

Fallout Radionuclides in Alaskan Native Populations

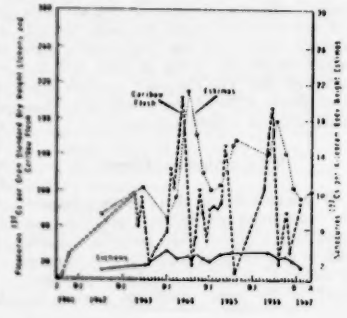
The degree to which the native populations of northern Alaska utilize caribou and reindeer for food varies considerably, de-

^{137}Cs Body Burden (nCi)*

Location	Summer 1962 n	Summer 1962 $\bar{x}$	Summer 1963 n	Summer 1963 $\bar{x}$	Summer 1964 n	Summer 1964 $\bar{x}$
Anaktuvuk Pass	39	450	44	640	40	1,330
Kotzebue	112	150	102	120	114	340
River villages	35	150	16	150	26	360
Barrow	248	55	119	65	—	—
Point Hope	60	19	78	40	—	—
Coastal villages	8	100	—	—	2	130
Little Diomede	15	29	—	—	—	—
Fort Yukon	—	—	56	37	—	—
Arctic Village	—	—	—	—	25	640

* n = number of people; $\bar{x}$ = mean.

Fig 2.—Cesium 137 concentrations in lichens, caribou, and Eskimos at Anaktuvuk Pass, Alaska, during 1962 to 1967.



pending upon location and ethnological grouping. In the years 1962 to 1964 we measured γ-emitting radionuclide concentrations in 2,500 natives from the major ethnic groups of northern Alaska (Fig 1), and in extensive samplings of their foods.[11,12] Cesium 137 was the most important, and often the only γ-emitting fallout radionuclide found in the people, although several others were present in their foods. Average ^{137}Cs body burdens of adult natives of the various groups maintained the same general ranking during the study period (Table); the values were directly proportional to quantity of caribou or reindeer consumed as estimated by the people at the time of measurement. Maximum ^{137}Cs levels occurred in the Anaktuvuk Pass Eskimos, who are more dependent upon caribou for basic food than are the inhabitants of other Alaskan villages; median values occurred in river village and coastal Eskimos and the Arctic Village Indians, whose diets contain appreciable amounts of fish, marine mammals, or processed food; and lowest levels were found in Little Diomede Eskimos and Fort Yukon Indians.

Based on these data, our radiation ecology studies since January 1964 have centered at Anaktuvuk Pass (68° 10′ North, 151° 46′ West). The close relationship between the nunamiut Eskimos and their environment is exemplified by the cycling of ^{137}Cs in the lichen-caribou-Eskimo food web (Fig 2). The long-term trend was one of gradually increasing ^{137}Cs concentrations in all components of the food web until mid 1966. This is particularly apparent in the lichen data. Cesium 137 concentrations in caribou flesh followed a similar trend but with marked seasonal fluctuations and exceptionally high values during the spring of 1964 and the spring of 1966. The Eskimo ^{137}Cs body burdens closely followed the trends in caribou flesh, with an evident time-lag.

^{137}Cs in Alaskan Lichens

It is now apparent that lichens represent the most important reservoir of ^{137}Cs and other fallout radionuclides potentially available to man via food chains. Direct sorption of material (deposited mainly by precipitation) is the most significant process by which fallout is accumulated by arctic flora; plants with persistent aerial parts consistently contain greater amounts of fallout radionuclides than do those that produce new foliage each year.[13-15] Lichens serve as efficient concentrators of deposited fallout because of their longevity (decades or centuries), persistence of aerial parts, and their dependence upon nutrients dissolved in precipitation. These properties result in a tenacious holding of ^{137}Cs and maintain an appreciable level of the radionuclide in the principal winter diet of caribou and reindeer.

We have noted differences in ^{137}Cs concentrations between several lichen species representing various phenological types, which emphasize that radionuclide burdens in lichens tend to be ranked by each species' ecological niche, structural diversity, and growth pattern. Highest levels were usually observed in *Cornicularia* lichens on windswept ridges which were thus exposed to the atmosphere during periods of five to six months when snow shielded most of the other lichen species from direct fallout deposition. *Cladonia* lichens from snow accumulation areas tended to decrease in ^{137}Cs concentrations during periods of snow cover and then regain original levels following snow melt. Comparison of seasonal behavior of several other fallout radionuclides suggested that ^{137}Cs may be preferentially absorbed from the snow melt water.[16] The lichen curve in Fig 2 is thus expected to turn upward during the summer of 1967 as ^{137}Cs is released from melting snows.

The effective half-time of ^{137}Cs in lichens, as a result of biological and physical loss, has been estimated at 17 years[17] and six to ten years,[18] based on the change in ^{137}Cs levels in lichens, compared to ^{137}Cs deposition, in northern Scandinavia. Our experiments with ^{134}Cs and ^{137}Cs applied to natural lichen communities in northern Alaska indicate that the effective half-time could well exceed ten years.[19] Certainly, significant levels of ^{137}Cs in the arctic lichen reservoir should persist for many years yet.

^{137}Cs in Alaskan Caribou

Cesium 137 concentrations in caribou flesh consumed by Anaktuvuk Pass Eskimos

revealed an annual pattern consisting of (1) a fairly stable winter level, followed by (2) an abrupt increase following the spring kill of migrating animals, (3) a rapid decrease to the annual low succeeding the fall kill of southward migrating animals, and (4) an increase to the winter levels. The abrupt increase in the spring is believed due to an influx of caribou migrating from distant ranges where the animals had grazed for several months on plants that contained ^{137}Cs concentrations greater than those of the Anaktuvuk Pass region. This conclusion is based upon the absence of a similar increase in lichen samples and on limited observations of caribou migration patterns. The rapid decrease of ^{137}Cs levels in caribou flesh during summer months is consistent with the short biological half-time (approximately three weeks) observed in reindeer.[17,20,21] The half-time in Alaskan caribou may well be shorter than the value of 27 days calculated from the decrease in ^{137}Cs flesh concentrations from May to September because there was undoubtedly some intake of ^{137}Cs during this period.[17] The prompt increase during fall months coincides with the change from a summer diet of green plants low in ^{137}Cs to the winter diet, which is largely composed of lichens. The magnitude of change of ^{137}Cs in caribou flesh from spring high to fall low is about a factor of 10; the lower values in fall caribou flesh were about the same as those in lichens. On the average, a concentration factor of about 2 occurred between the first and second trophic levels of the food web.

We consider the ^{137}Cs levels in spring caribou flesh at Anaktuvuk Pass during 1964 and 1966 to be unusually high, perhaps due to the animals' having wintered on ^{137}Cs-rich ranges not previously grazed, and/or to greater-than-normal precipitation. During 1963 and 1965, several stations in northern interior Alaska reported precipitation totals substantially greater than average and the increased fallout deposition resulting therefrom would be reflected by the lichens. Most of the ^{137}Cs deposited on lichens is retained in the upper few centimeters of living material. Since this is also the portion normally taken by grazing caribou, a major ^{137}Cs deposition could thus be transferred to caribou in the winter following such an event. Our results show a steady increase of ^{137}Cs in lichens and caribou flesh until mid 1966, whereas the Scandinavian Lapland data apparently reached maximum values in 1965.[17,18] This difference may be due to the reindeer herding practices of Lapps, that permits the identification of specific groups, and which also may result in animals regrazing ranges where the ^{137}Cs-rich top parts of the lichens had been previously removed.[22]

It is difficult to secure satisfactory detail on radionuclide concentrations among the caribou herds and their ranges in northern Alaska because of the extensive area, diverse environments, and uncertain migratory movements. During 1963 and 1964, we sampled caribou, reindeer, and moose from various Alaskan locations extending from Saint Paul Island in the Pribilofs to the Canadian border.[23] Results indicated that there were no major differences in the radionuclide burdens of reindeer and caribou from the same location. There was a sixfold difference in ^{137}Cs concentrations sampled at about the same time. Radionuclide concentrations in tissues of caribou were tenfold higher than in moose collected from the same environment at the same time. This difference is due to the moose's habit of browsing willow, birch, and aspen, rather than feeding on lichens. This also accounts for the lack of seasonal variation in ^{137}Cs concentrations in the moose. Caribou samples from the Arctic Slope of the Brooks Range and from the Arctic coast between Point Hope and Barrow tended to have lower ^{137}Cs concentrations than those from Anaktuvuk Pass. Animals from the Noatak and Kobuk River drainages tended to have the highest ^{137}Cs concentrations of the Arctic caribou herds. We have been unable to satisfactorily demonstrate a statistically significant difference between animals from various locations. Within any one herd of Alaskan caribou there has usually been a coefficient of variation of about 30% in the ^{137}Cs concentrations.[24] Scandinavian investigators report variability in reindeer ^{137}Cs values due to physiological factors.[18,20]

Comparison of limited numbers of samples from other areas suggests that the ^{137}Cs concentrations of the Alaskan Peninsula caribou herd were slightly greater than those of the Nelchina herd, which, in turn,

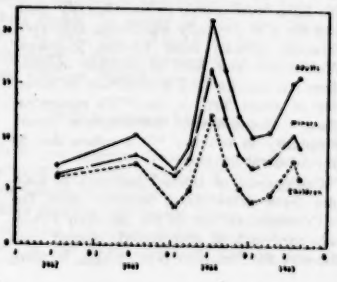
were greater than those of the Arctic herd sampled at Anaktuvuk Pass. These differences correlate with the precipitation values for the respective areas; however, any such interpretation must be tempered by the previous discussion of variability. It should also be noted that the Peninsula and Nelchina herds are less important to native populations than is the Arctic herd.

^{137}Cs in Alaskan Natives

The relationship of the ^{137}Cs seasonal cycles in lichens and caribou to those in Eskimos at Anaktuvuk Pass reflects the dependence of these people upon their local environment. These people represent the last major remnant of nunamiut Eskimos who were formerly nomadic but now remain at their mountain village site. Their culture has always centered on the caribou, and the welfare of the people is still highly dependent upon the local environment. Caribou meat forms about one half of the total diet, partly because of necessity and partly because the people prefer it to other foods.

The seasonal pattern of ^{137}Cs concentrations in the Anaktuvuk Pass Eskimos lags behind the concentration in the caribou because of the timing of the main caribou kills and the stockpiling practices. Animals killed during the fall season (September-October) are returning from summer ranges and contain ^{137}Cs levels about one tenth those of spring-killed animals. This meat forms the base of the fall and early winter diet of the

Fig 3.—Seasonal variation of ^{137}Cs concentration in adults (over 21 years), minors (15 to 20 years), and children (3 to 14 years) at Anaktuvuk Pass, Alaska.



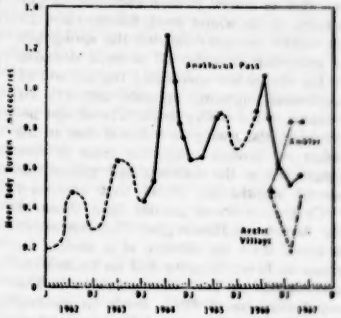


Fig 4.—Cesium 137 body burdens in adult natives at Anaktuvuk Pass, Ambler, and Arctic Village.

Eskimos. It is a preferred food because of its high fat content. Eskimo ^{137}Cs body burdens begin the September-January decrease when these animals are being eaten. During mid-winter the meat from caribou killed in the fall is usually exhausted and the Eskimos eat caribou obtained from nearby winter ranges, where lichens constitute the major food for the animals. This causes Eskimos ^{137}Cs body burdens to increase at a moderate rate during this period.

The spring caribou harvest is made during April and May as the animals migrate northward from their winter ranges, at which time they contain the highest ^{137}Cs concentrations of their annual cycle. This meat is stored in underground caches for use throughout the summer. Maximum observed Eskimo ^{137}Cs body burdens usually have occurred about two to three months after the dietary change to spring-killed caribou. The graph of Eskimo body burdens in Fig 2 prior to January 1964 and during the period August 1965 to May 1966 is drawn point-to-point and does not show seasonal variations as defined by bimonthly measurements made during the period January 1964 to August 1965 and from May 1966 to date. Comparison of ^{137}Cs body burdens from one summer to the next showed a pronounced increase of about 50% from 1962 to 1963, a doubling between 1963 and 1964, a 30% decrease from 1964 to 1965 and then a 25% increase from 1965 to 1966. This is consistent

with the pattern of change of ^{137}Cs concentration in caribou flesh. However, the ^{137}Cs concentration in lichens showed a steady increase during this entire period. Thus, the decrease from 1964 to 1965 was inconsistent with the ^{137}Cs increases in lichens as were the abrupt increases during the spring of 1964 and that of 1966, which emphasizes the probable importance of caribou migration patterns in the determination of ^{137}Cs levels in the Eskimos.

Utilization of other animals for food had an insignificant effect upon the ^{137}Cs body burdens of the Anaktuvuk Pass residents. Dall sheep (*Ovis dalli*) are occasionally eaten for a short time in the autumn, principally by men trapping at distant locations from the village. Several samples of sheep taken by the hunters during the fall and winter months contained one seventh the ^{137}Cs concentrations of caribou ranging in the same general area. Ground squirrels (*Citellus parryi*) and arctic graying (*Thymallus arcticus*) are eaten in small amounts during spring and autumn months, respectively, and contain minute amounts of radionuclides. Moose (*Alces alces*) and barren-ground grizzly bears (*Ursus arctos*) are infrequently taken by hunters and also contain low ^{137}Cs concentrations.

Male adults between the ages of 21 and 50 usually have contained the highest body burdens of ^{137}Cs, apparently due to their greater proportion of muscle and greater consumption of caribou. Minors (15 to 20 years old) had 70% levels and children (3 to 14 years old) had levels of 50% as much ^{137}Cs per kilogram body weight as adults (Fig 3). Comparison of males and females during annual maxima indicated no important differences in their ^{137}Cs body burdens until about the age of 20; males then consistently contained more ^{137}Cs than did females. Maximum differences between sexes occurred at about the age of 40 years, and the difference then decreased during advanced ages.[23] Maximum body burdens were usually twice the mean of all adults and were usually found in the same few men.

The rate of elimination of ^{137}Cs from the body was found to vary with age and body weight in a study of 28 Anaktuvuk Pass natives who were removed from their normal caribou meat diet during August 1965.[19] Retention half-times were about 65 days for adults, 52 days for minors, and 40 days for children. These values are comparable to those reported for other arctic peoples, and account for the prompt human response to any change in the ^{137}Cs level in their diet.

The differences in food-gathering cultures of northern Alaska, result in important seasonal changes in ^{137}Cs in the native diet. We are currently defining and comparing the seasonal cycles of different caribou utilization patterns at three Alaskan villages: Anaktuvuk Pass, Arctic Village and Ambler. Anaktuvuk Pass has already been discussed in detail. Ambler was selected for study because it is near the center of habitation of the river village Eskimos along the Noatak and Kobuk rivers. These people depend upon caribou for about 30% of their food, particularly during fall and winter months when caribou are nearby. Fish comprises about 25% of their diet and marine mammals contribute about 11% during spring months. Arctic Village is a northernly Athapaskan Indian village in the Alaskan interior whose residents depend upon caribou for about 40% of their food. Heaviest utilization occurs during fall, winter, and spring when the caribou migrate past the village.

Periodic measurements of native ^{137}Cs body burdens at the three villages were begun in October 1966 and four visits have now been made. Results (Fig 4) show that the seasonal cycles of ^{137}Cs in the people at Anaktuvuk Pass and Ambler are distinctly different with the Ambler high occurring during the Anaktuvuk low and vice versa. Arctic Village suffered a disastrous loss of the entire fall kill of caribou meat due to unseasonably warm weather during September and October 1966 and experienced hardship during the following winter. Fish and a few moose provided their main wild meat for most of this period, and ^{137}Cs burdens decreased by 60% in about four months. A three- to four-week supply of caribou was obtained in March and ^{137}Cs body burdens returned to October levels in the five weeks between the arrival of this meat and the last measurement. The recent record of ^{137}Cs levels for this village is, therefore, atypical.

Wolf flesh obtained from the Anaktuvuk Pass region, where wolves are presumably

dependent upon caribou for their main diet during the period of September to March, contained about twice the ^{137}Cs concentrations found in caribou flesh. Estimates of Eskimo ^{137}Cs concentrations in flesh, based on conversion of body burden to muscle mass equivalent, yielded values for human flesh about the same as those for caribou flesh. About half the Eskimos' food was caribou meat, and it is therefore reasonable to assign a concentration factor of 2 to the caribou-carnivore (including man) link of the Alaskan food chain.

^{137}Cs-^{90}Sr Relationships in Biota

Strontium 90 is more mobile within lichens than is ^{137}Cs, as indicated by (1) a change in the $^{137}Cs/^{90}Sr$ ratio from about 1.4 to 2.0 in atmospheric fallout to about 3 to 5 in most lichen samples; (2) a fairly uniform ^{90}Sr distribution throughout natural lichen thalli compared to greater ^{137}Cs concentrations in the upper portions of lichens than in the lower portions; (3) recent labeling experiments reported by Russian investigators[21]; and (4) our experiments with radionuclides applied to natural lichen communities in northern Alaska.[19] This mobility accounts for the diminution of ^{90}Sr concentrations in Alaskan lichens since January 1964, compared to the steady state of ^{137}Cs concentrations (Fig 5). Strontium 90 concentrations in caribou bone samples increased steadily during the period 1962 to 1965 and then leveled off during 1966. Most of the animals were 4 to 9 years old, which may account for the time-lag between the trends in animals and in their principal source of ^{90}Sr. Comparison of levels in a few caribou bone samples as related to the animals' age disclosed no clear relationships; however, this may well be due to small sample size variability. Schultz and Flyger[26] reported a statistically significant difference between ^{90}Sr concentrations in various age classes of Maryland deer mandibles and an increasing trend during a period of increasing fallout deposition.

Strontium 90 concentrations in bones of about 15 wolves taken near Anaktuvuk Pass each year, mostly during winter months, of the period 1960 to 1966, showed an increasing trend with time. Amounts seemed fairly

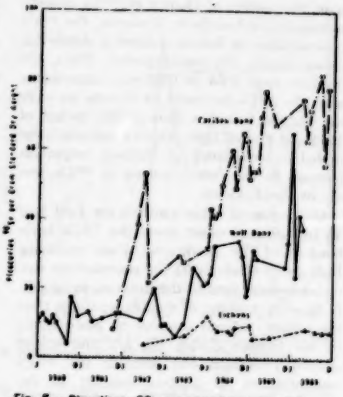


Fig 5.—Strontium 90 concentrations in biota at Anaktuvuk Pass, Alaska, during 1960 to 1966.

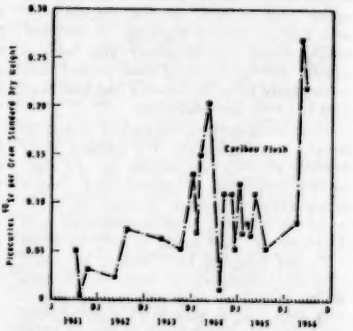


Fig 6.—Strontium 90 concentrations in caribou flesh at Anaktuvuk Pass, Alaska, during 1961 to 1966.

stable at about 10 pCi/gm during 1960 to 1963 and then increased and averaged about 30 pCi/gm during 1964 to 1966. Radiologic units commonly used to describe small amounts of radionuclides are expressed as fractions of the standard curie [Ci] which is a unit quantity of any nuclide in which 3.7×10^{10} disintegrations occur per second. A picocurie [pCi] is 10^{-12} curie, a nanocurie [nCi] is 10^{-9} curie, a microcurie [μCi] is 10^{-6}

curie, and a millicurie [mCi] is 10^{-3} curie.) These values were about one half those in caribou bone and illustrated the blocking of transfer from herbivore to carnivore because of ^{90}Sr concentration in bone. Such transfer as did occur may be explained by the fact that wolves eat appreciable amounts of caribou bone.[27] The trend of ^{90}Sr concentration in wolf bones was more closely allied to that in caribou bone than with the trend in caribou flesh (Fig 6). The flesh values fluctuated substantially about a median value of approximately 0.07 pCi/g, or about 1/500 the concentration in caribou bone. Maximum ^{90}Sr concentrations in caribou flesh occurred during May in 1964 and 1966, and minimum values prevailed during August; these corresponded to times of maximal and minimal ^{137}Cs concentrations.

Radiological Health Considerations

The radiological health implications of current amounts of ^{90}Sr and ^{137}Cs in Alaskan biota are logically considered separately.

Strontium 90 in humans cannot presently be quantitated by whole-body counting, and the most direct method of evaluating human radiation exposure is by calculating the ^{90}Sr intake in foods and comparing it with standards adopted by national and international agencies. Estimates of ^{90}Sr ingestion via caribou meat by Anaktuvuk Pass adult Eskimos during summers of 1961 to 1966 were 11, 5, 13, 24, 15, and 31 pCi/day, respectively. This plane of ^{90}Sr was presumably maintained for about four to five months following the spring kill of caribou and it then decreased with the use of fall-killed animals. Thus, ^{90}Sr ingestion rates of these people were within Range I (0 to 20 pCi/day) of the Federal Radiation Council's Radiation Protection Guide,[28] except for brief periods during the summers of 1964 and 1966.

Whole-body radiation exposures of Anaktuvuk Pass adults were calculated by determining average annual ^{137}Cs body burdens from the area under the curves in Fig 4 and applying appropriate equations.[29,30] The annual exposures thus estimated were 56, 90, 144, 138, and 142 millirem (A millirem corresponds to an absorbed dose in tissue that is considered to result in biological damage equivalent to that produced by one millirad [0.001 rad] of x-radiation [of about 200 kv energy]. The rad corresponds to an energy absorption of ionizing radiation in the medium of 100 ergs/gm and the medium referred to here is human tissue. The millirem and millirad may be considered equivalent for the purposes of this discussion.) for the years 1962 to 1966. For purposes of comparison, the dose to which all people are exposed because of cosmic radiation, naturally-occurring radionuclides in rocks and soil, and naturally-occurring radioactive isotopes which are in our bodies, is about 130 millirads per year. The probability of significant biological effects from these levels of exposure is extremely remote.[31,32] While it is impossible to give positive assurance that there is *no effect* of fallout radiation upon human or animal populations of northern Alaska (or of any other area of the earth), it is the concensus of responsible scientists that current exposure levels are substantially below those at which biological effects have been observed, and the measures to mitigate these radiation exposures would be misdirected. Misinformed or irresponsible discussion of the Alaskan fallout situation in terms of potential hazard has in the past created serious concern among the native peoples most vitally involved. Further, any remedial measures yet suggested could be expected to have important deleterious effects on the well-being of the villagers.

Future Situation

Assuming no future increases in fallout deposition rates will occur, the amounts of radionuclides in northern Alaskan ecosystems should continue to decline. We can infer from estimates of a ten-year effective half-time of ^{137}Cs in lichens that it will remain the artificial radionuclide of major importance. Unusual situations, such as the exceptional ^{137}Cs concentration in caribou flesh at Anaktuvuk Pass during the springs of 1961 and 1966, can be expected to recur; however, the period of average build-up appears to have passed. The present trend of many Alaskan native groups towards more dependence upon processed food and other cultural innovations that result in less dependence upon caribou and reindeer for food will result in reduced radionuclide in-

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i.e. The recent Chinese nuclear weapons test may reverse these trends, particularly if they portend further high energy yield tests in the atmosphere.

Summary

Studies of radioactive fallout in Alaskan arctic ecosystems were conducted during the period 1959 to 1967 to define routes, rates, and amounts of several radionuclides in a region where wildlife resources are important to human welfare. Emphasis was placed on seasonal measurements of ^{90}Sr and ^{137}Cs in all trophic levels of the lichen-herbivore-carnivore food web at Anaktuvuk Pass during the years 1962 to 1967.

Cesium 137 concentrations increased by a factor of two at each successive trophic level of the lichen-caribou, reindeer-man, wolf-food chain. This resulted from (1) the unusual capacity of lichens to absorb and retain fallout materials, especially ^{137}Cs; (2) the utilization of lichens as a basic winter food by caribou and reindeer; and (3) the dependence upon caribou and reindeer for food by northern peoples and wolves. Strontium 90 was less important than ^{137}Cs because it was more mobile in lichens and tended to be blocked from appreciable transfer to carnivores by accumulation in bone.

Regional and local differences in ^{137}Cs concentrations were noted among plant and animal species and among ethnic groups of natives. A definite seasonal cycle of ^{137}Cs was found in the biota which illustrated their close relationship to the environment and the simple structure of arctic ecosystems. Cesium 137 concentrations in caribou flesh and Eskimos at Anaktuvuk Pass attained maximum values during spring and summer months, respectively. Unusually high values during 1964 and 1966 were ascribed to caribou migrations from distant winter ranges with greater ^{137}Cs levels in lichens than those measured in lichens at Anaktuvuk Pass, and to the subsequent use of these animals by the Eskimos.

Radiation exposure of Anaktuvuk Pass Eskimos from ^{137}Cs body burdens during each year of the period 1962 to 1966 varied from 59 to 144 millirem, which is of the same order as natural background radiation. Except for brief periods, ^{90}Sr ingestion rates via caribou meat was within Range I of the Federal Radiation Council's radiation protection guides.

It is concluded that appreciable amounts of fallout radionuclides, especially ^{137}Cs, will remain in Alaskan biota for several years. The radiation exposure is not now, nor expected to be, hazardous to animals (including man). We believe continued study is necessary to continue to increase and improve knowledge of the processes involved in radionuclide transfer within Alaskan arctic ecosystems.

This study was based on work performed under Atomic Energy Commission contract AT (45-1)-1830. Dr. Max C. Brewer, Director of the Arctic Research Laboratory, Barrow, Alaska, provided use of field facilities. The Alaska Department of Fish and Game supplied bones from 50 wolves for ^{90}Sr analysis. The Public Health Service Alaska Native Service Hospitals at Barrow and Kotzebue provided use of hospital facilities. Mrs. D. D. Wade and Mr. H. A. Sweany processed samples and data.

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A POX UPON THEE

. . . the smallpox epidemic of 1721 proved to be a turning point in the control of this dread disease. Thanks to the cooperation of a few far-sighted laymen and physicians, particularly Cotton Mather and Dr. Zabdiel Boylston, and the willingness of a large number of citizens to experiment with a procedure whose validity seemed to be established scientifically, inoculation came to be accepted widely in New England. The pattern thus being established, conservative opposition was to be far more easily overthrown when Jenner's method of vaccination was introduced at the very beginning of the next century.—Rudolph, R., and Musher, D.M.: Inoculation in the Boston Smallpox Epidemic of 1721, *Arch Intern Med* 115:602-606 (June) 1965.

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Fallout Radionuclides in Alaskan Food Chains

Barrow Fi...
Barrow Fi...

W. C. Hanson, B.S.

SUMMARY

Results of radioecologic research in northern Alaskan ecosystems during the period 1959–1965 showed that strontium-90, iodine-131, and cesium-137 were the most important fallout radionuclides from a public health standpoint.

Iodine-131 concentrations in caribou thyroid glands usually obtained maximum values about 2 months following a major series of atmospheric nuclear weapons tests. Alaskan samples usually peaked about 6 days earlier than and at levels about one-half of samples from Colorado deer. Measurable amounts of ^{131}I were in thyroid glands for about 4 months following the last nuclear test. Total radiation dosages absorbed by the animal thyroid glands were much less than those at which damage might occur.

Strontium-90 and ^{137}Cs concentrations in Alaskan arctic biotic increased gradually from 1959 through 1962, and then increased rapidly. The lichen-caribou-man food web maintains radionuclide levels greater than in most other ecosystem components.

Strontium-90 concentrations in caribou bone samples from northwestern Alaska increased from about 10 to 20 picocuries (pCi) per gram of dry weight during 1960–1961 to about 50 pCi/Gm. in 1964. Concentrations in caribou bone were 3 to 4 times those in lichens and about 1,000 times those in caribou flesh. Strontium-90 ingestion rates of Anaktuvuk Pass Eskimos from caribou meat were within recommended radiation protection guides.

Cesium-137 concentrations in lichens doubled during the period 1962–1964. Greater than average precipitation may have been a major cause of the increase. Cesium-137 concentrations in lichens were about 7 times those of ^{90}Sr; among caribou flesh samples the ^{137}Cs:^{90}Sr ratio was about 800.

Caribou flesh ^{137}Cs concentrations changed greatly with season. Minimums occurred during summer periods when caribou were eating much green forage and maximums occurred during winter when lichens formed a major part of the diet.

There were no major differences in radionuclide burdens of caribou and reindeer samples collected from the same region. A tenfold difference between con-

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centrations in caribou and moose flesh collected from the same location at the same time is ascribed to very different food habits.

Cesium-137 body burdens in various ethnic groups of Alaskan natives during the summers of 1962-1964 were directly proportional to caribou or reindeer consumption. Maximum amounts in native residents occurred in Anaktuvuk Pass Eskimos, river village and coastal Eskimos contained intermediate amounts, and Little Diomede Eskimos and Fort Yukon Indians contained the least.

Periodic counting of Anaktuvuk Pass Eskimos demonstrated a seasonal cycle of ^{137}Cs body burdens. Lowest values occurred in January and maximum values during July. This resulted from the Eskimo practice of utilizing caribou killed during spring and fall seasons. Spring-killed animals contained greater ^{137}Cs concentrations than did fall-killed animals because of the utilization of lichens during winter periods.

Cesium-137 body burdens of Alaskan natives during the summer of 1963 were about 50% greater than during 1962 and, during 1964, were twice those of 1963.

From these results we conclude that ^{131}I is of transitory importance in Alaskan ecosystems while ^{90}Sr and ^{137}Cs are fallout radionuclides of long-range importance. The higher levels of ^{90}Sr and ^{137}Cs concentrations in the Alaskan lichen-caribou-man food web during the summer of 1964 resulted from (1) the ability of lichens to retain fallout radionuclides for considerable time; (2) the greater utilization of lichens for food, especially in winter, by caribou as compared to other animals; and (3) the dependence upon caribou or reindeer for food by certain native populations. Although there appear to be some differences between radionuclide concentrations in plants and animals from various locations in arctic Alaska, we have not been able to obtain samples adequate to demonstrate the statistical significance of such differences.

Prediction of levels of fallout radionuclides in the lichen-caribou-man food web must take into consideration the importance of environmental and human factors, which in turn require experience not easily gained. Probably the most important factor regulating future levels of ^{90}Sr and ^{137}Cs in Alaskan ecosystems is the ability of lichens to act as a reservoir of fallout. It is difficult to imagine a biologic system with the capability of retaining all of the fallout deposited within it, yet it has been suggested that lichens and mosses virtually do so.

Measurements made at Anaktuvuk Pass during the first few months of this year suggest that at least the period of maximum rate of build-up is past, but we are as yet not confident that we have enough information to accurately predict future levels. We do, however, feel that the basic elements of the situation are reasonably well understood and that projected research will greatly improve the prediction capability.

This report will be restricted to discussion of fallout radionuclides in northern Alaskan ecosystems with which we have had experience since 1959. Our research in this area has been directed toward evaluating the effect of environmental factors upon routes and rates of radioactive fallout concentration in natural populations of plants and animals, including man.

The fallout radionuclides of greatest current interest to public health veterinarians and biologists in general are strontium-90, iodine-131, and cesium-137; the several others identified in fallout either exist in

trace amounts or are biologically inactive. Iodine-131 has been of transient interest following major nuclear weapons' tests because its physical half-life of 8 days rapidly removes it from the environment. Strontium-90 and ^{137}Cs, with physical half-lives of 28 and 30 years, respectively, remain for considerable time and allow extended study of their cycling properties in biologic systems. This is particularly true in arctic ecosystems, where lichens function as a reservoir of fallout radionuclides originating in the larger nuclear explosions which began about 1954. Of these 2, ^{137}Cs is of greatest current interest because of its greater abundance in the lichen-caribou-man food web and its ease of measurement by *gamma* scintillation counting methods.

Iodine-131

Radioiodine is the most important radionuclide in the so-called "prompt fallout" immediately following a nuclear explosion. Its concentration in thyroid glands of North American deer and caribou was measured during the 1961–1963 series of atmospheric nuclear weapons tests conducted by Britain, France, Russia, and the United States.[6,7] Results showed that maximum concentrations in thyroid glands occurred about 2 to 3 months after the initiation of a major nuclear test series and that values in Alaskan animals were significantly lower than those in deer and elk from 5 locations within the conterminous United States. Maximum ^{131}I concentrations during the fall of 1961 occurred about 6 days sooner in Alaskan animals than in Colorado deer, but at about one-half the concentrations. Higher levels were maintained for varying time periods, depending upon the testing period. During 1961, values decreased at a half time of about 15 days, indicating that gradually decreasing increments of radioiodine were added to the environment during this period. Lower levels in Alaskan samples may be due to either less ^{131}I deposition in the Arctic or to the habit of caribou or reindeer of digging for food covered with snow and thus protected from ^{131}I deposition. Comparative thyroid gland dose rates given by ^{131}I during the study for animals at various localities during the 1962–1963 study were about 4 times greater than during the 1961–1962 study and were estimated to be 20.0 rad in Colorado deer; 7.6 rad in Washington and Wyoming deer and elk; 2.5 rad in California, Maryland, and New York deer; and 0.8 rad in Alaskan reindeer. These dosages are many times less than those at which histologic damage may be expected to occur.[1]

Strontium-90

Upon comparison of ^{90}Sr concentrations in various Alaskan plants and animals, it was shown that its adsorption by aerial parts of plants is its most important entry route into food webs.[15] The long life span, persistance of aerial parts, high ratio of surface area to mass and a capacity to obtain most of their nutriment through absorbed moisture thus make lichens an effective accumulator of ^{90}Sr. The utilization of lichens for food by caribou and reindeer, particularly during winter periods, results in greater ^{90}Sr concentrations in these animals than in other important Alaskan game animals. Strontium-90 is metabolically similar to calcium and concentrates most importantly in bone. Its concentration in lichens and caribou bone samples from the northwestern part of Alaska during the period 1960–1961 showed a gradual increase from about 10 picocuries * per gram of dry weight during mid-1960 to about 20 pCi/Gm. of dry weight at the end of 1961. Subsequently, values have increased to about 50 pCi/Gm. during mid-1964 at Anaktuvuk Pass, located in the central Brooks Range (Fig. 1). Bone values have consistently been 3 to 4 times those of lichens, which are considered to be the most important source of fallout radionuclides available to caribou, and about 1,000 times greater than those of caribou flesh. On the basis of dietary information obtained from Anaktuvuk Pass Eskimos, who consume

* Radiologic units commonly used to describe small amounts of radionuclides are expressed as fractions of the standard curie (Ci) which is a unit quantity of any nuclide in which 3.7×10^{10} disintegrations occur per second. A picocurie (abbreviated pCi) is 10^{-12} curie, a nanocurie (nCi) is 10^{-9} Ci, a microcurie (μCi) is 10^{-6} Ci and a millicurie (mCi) is 10^{-3} Ci.

more caribou than most other Alaskan native groups, the average ^{90}Sr ingestion rates resulting from caribou flesh consumption during the period 1961–1964 were within the lower ranges of Federal Radiation Council radiation protection guides.[3]

Cesium-137

Cesium-137 is metabolically similar to potassium and concentrates in muscle and soft tissues. It enters Alaskan food webs principally through adsorption by aerial parts of plants, particularly lichens, and is then readily transferred through terrestrial food chains. Much lower values, often at or near detectable limits, occur in marine and freshwater ecosystems because of the dilution of fallout in aquatic environments and the presence of much greater amounts of stable elements which compete with their radioactive isotopes. Greatest amounts of ^{137}Cs have usually been associated with the lichen-caribou-man food web. During the period 1959–1964, ^{137}Cs concentrations in lichens and caribou flesh showed a variation with time similar to that of ^{90}Sr. Values in lichens increased fairly steadily from 1959 to 1962 and then increased more rapidly during 1963 and 1964. These 2 seasons followed years in which precipitation was greater than normal. During 1963 several stations in northern Alaska reported precipitation totals 50% greater than average.[14] It is generally recognized that fallout deposition is proportional to rainfall.[11] The unique characteristics of lichens mentioned previously would reflect this greater fallout deposition.

Cesium-137 concentrations in lichens from Anaktuvuk Pass showed little or no seasonal variation, and maintained nearly constant values of about 30 pCi/Gm. of dry weight from January, 1964, through March, 1965. Caribou flesh, by comparison, varied over a tenfold range of concentrations. Seasonal minimums occurred during summer periods (July or August) of each year and were about the same as ^{137}Cs concentrations in lichens. Although the data (Fig. 1) indicate the seasonal maximums in caribou flesh to be in spring months (March–June), the metabolic behavior of ^{137}Cs in ruminants[2,5] indicates

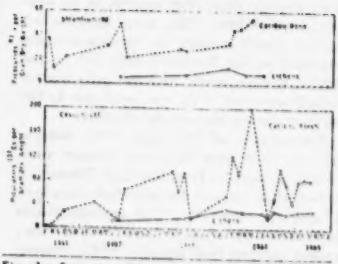

Fig. 1—Strontium-90 and cesium-137 concentrations in lichens and caribou at Anaktuvuk Pass during the period 1961–1965.

that the caribou should be in equilibrium with their diet during the winter period and that ^{137}Cs values would logically plateau at an upper level at that time. The animal samples obtained in our studies during early spring were taken at the time caribou were migrating from the winter range and may, in fact, represent a condition which persisted during a majority of the winter period when the caribou were on a fairly steady diet of lichens. The sudden increase in ^{137}Cs concentrations in caribou at Anaktuvuk Pass during May, 1964 is unexplained by our data. It is possibly due to movement of caribou to ranges containing greater concentrations of ^{137}Cs

TABLE 1—Cesium-137 Concentrations in Lichens and Caribou Flesh at Various Locations in Northern Alaska During Summer Periods of 1959–1964: All Values are in Picocuries ^{137}Cs per Gram Dry Weight

Year	Cape Thompson	Kostak-Kobuk Rivers	Anak-tuvuk Pass	Fort Yukon-Arctic Village
Lichens				
1959	27	...	...	...
1960	26	...	...	...
1961	37	...	...	...
1962	24	17	13	...
1963	39	29	17	32
1964	69	61	27	82
Caribou Flesh				
1960	2.5	7.7	...	...
1961	5.9	40	8.8	...
1962	8.1	...	33	21
1963	16	13	16	61
1964	...	860	17	150

than during preceding months or to sampling variability. This same increase occurred simultaneously in caribou samples obtained in the Noatak-Kobuk Rivers and Arctic Village areas, and indicates an enriched source of ^{137}Cs was available to the caribou during the spring of 1964.

Comparison of ^{90}Sr and ^{137}Cs concentrations in lichens indicated greater variability in samples from the Cape Thompson region than in samples collected elsewhere (Table 1). Generally, ^{137}Cs concentrations in lichens were about 7 times those of ^{90}Sr; among caribou flesh samples, ^{137}Cs concentrations were about 800 times those of ^{90}Sr. This is due to the well-known accumulation of ^{90}Sr in bone and ^{137}Cs accumulation in muscle and soft tissues.

Differences were noticed among ^{137}Cs concentrations in caribou flesh samples from various areas within the range of the Arctic caribou herd. Animals obtained in the Noatak and Kobuk river drainages often contained higher concentrations at a given time than did animals from other locations. Anaktuvuk Pass caribou values were often lowest of major areas of collection but less variable in time. It is difficult to characterize ^{90}Sr and ^{137}Cs concentrations during any one time among the various caribou and reindeer herds of Alaska because of the extensive variation in area, environments and animal numbers. During 1963 and 1964 we sampled caribou, reindeer and moose from various Alaskan locations extending from St. Paul Island in the Pribilofs to the Canadian border.[10] Results indicated there were no major differences in the radionuclide burden of reindeer and caribou from the same location, a sixfold difference in ^{137}Cs concentrations in individual animals from various locations sampled about the same time, and a tenfold difference between ^{90}Sr and ^{137}Cs concentrations in tissues of caribou and moose collected from the same environment at the same time. We have also reported a tenfold difference between ^{137}Cs concentrations in individual reindeer flesh samples from animals maintained within 50 miles of each other.[6] Caribou samples from the Arctic Slope of the Brooks Range and the Arctic coast between Point Hope and Barrow apparently have lower ^{137}Cs concentrations than those of Anaktuvuk Pass. We have been unable to demonstrate the statistical significance of these differences between animals from various locations.

Barrow
Point Hope
Arctic Village
Kotzebue
Fort Yukon
Eagle
Eagle
Dawson
Eagle
Eagle
Eagle

a semiportable whole body counter to measure *gamma* radioactivity in human populations of arctic Alaska (Fig. 2).[8,9,13] Cesium-137 was the most important, and often the only, fallout radionuclide observed in *gamma* spectrums of 2,496 persons examined to date. Average ^{137}Cs body burdens of adult natives of various ethnic groups retained the same general ranking during the study (Table 2); the values were directly proportional to caribou or reindeer consumption as estimated by the people at the time of counting. Anaktuvuk Pass Eskimos contained more than did other groups of natives, river village and coastal Eskimos contained intermediate amounts, and Little Diomede Eskimos and Fort Yukon Indians contained the lowest amounts. Dietary information showed that lower amounts of ^{137}Cs were associated with native groups who ate appreciable amounts of fish, marine mammals, or processed foods. Adults contained more ^{137}Cs than did children, men more than women, and children who attended boarding schools outside the villages contained less than their brothers and sisters who remained at home during the year. There appeared to be no difference between males and females up to about 20 years of age (Fig. 3); at ages greater than 20 males usually contained more ^{137}Cs than females, and maximum body burdens usually occurred in persons between 40 and 60 years old. The maximum individual ^{137}Cs body burden occurred in a non-native adult who consumed unusually large amounts of caribou meat.

Dietary information obtained from the natives showed that utilization of a particular food was influenced primarily by its availability, especially among those people in remote villages where hunting and fishing provided most of the food, and secondarily, by increased metabolic demand during cold weather. Cesium-137 concentrations in caribou flesh samples were highest in animals killed during winter or early spring months and lowest in summer-killed animals. On the basis of this information it appeared that, among natives utilizing caribou continuously, ^{137}Cs body burdens would reach a maximum during winter or early spring months. Periodic counting of Anaktuvuk Pass natives at about 2-month intervals was begun in January, 1964, because of the close relationship between these Eskimos and their environment.[10]

Cesium-137 body burdens in the Anaktuvuk Pass Eskimos showed a definite seasonal pattern with lowest values during January of each year and maximum values during July. This results from the Eskimo practice of killing a supply of caribou when

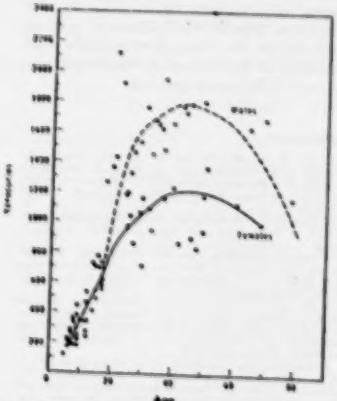

Fig. 3—Cesium-137 body burdens of Anaktuvuk Pass Eskimos as a function of age during July, 1964.

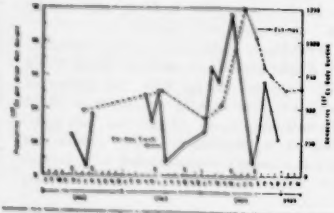

Fig. 4—Cesium-137 in caribou flesh and Eskimos at Anaktuvuk Pass during the period May, 1962–March, 1965. Arrows on abscissa indicate major killing periods of caribou.

the animals pass near the village twice yearly. These 2 slaughter periods occurred at crucial times in the seasonal pattern of ^{137}Cs concentrations in caribou flesh (Fig. 4). Animals killed during fall months (late August to early October) are migrating from summer ranges on the Arctic Slope where their food consists principally of green vegetation containing relatively low ^{137}Cs concentrations. This meat is stockpiled for use throughout the winter and is supplemented by fresh animals which are usually to be found within a few miles of the village, and which contain increasing ^{137}Cs concentrations as the winter diet of lichens asserts its influence. Caribou migrating from the winter range are usually slaughtered in large numbers in late May and the meat stored in underground cellars ("caches") dug into the permafrost. These animals contain greater ^{137}Cs concentrations in their flesh than animals killed at other times of the year because of the extended period of lichen utilization by the animals on their winter range.

Maximum ^{137}Cs body burdens during 1964 occurred in Anaktuvuk Pass Eskimos 1 or 2 months after they began to use spring-killed animals and decreases accompanied a shift in diet to fall-killed caribou.

Comparison of ^{137}Cs body burdens from one summer to the next showed pronounced increases. Levels in 1963 were about 50% greater than during 1962, and during 1964 were about twice those of 1963. This same rate of increase occurred in caribou flesh, although the ^{137}Cs concentrations in Anaktuvuk Pass lichens, which form the base of the food web under discussion, increased gradually from 1962 to 1964, and during 1964 were essentially steady.

Whole-body radiation exposures received by Anaktuvuk Pass natives from ^{137}Cs body burdens during 1964, the period of maximum values, were estimated at about 150 millirems as an average and 300 millirems as a maximum. These values are within amounts recommended as a Radiation Protection Guide for this population group.[4]

The seasonal cycle of ^{137}Cs body burdens of other ethnic groups of Alaskan natives which utilized caribou extensively during winter months conformed to the anticipated pattern with maximum values during winter or early spring months. Measurements of 21 adult men were made during the spring of 1965 at the river village of Ambler and at Arctic Village. Cesium-137 body burdens were about 70 and 50% greater, respectively, than those measured in these groups during the summer of 1964. Both groups use only a limited amount of caribou during summer but depend upon fish for their main meat source.

Our studies of ^{137}Cs body burdens in northern Alaskan Eskimos have produced results similar to those reported in northern Finnish Lapps.[12] Cesium-137 values in reindeer and Reindeer Breeder Lapps appeared to follow a seasonal pattern with maximum amounts in Lapps during spring months (April and May) rather than during summer as in the Anaktuvuk Pass Eskimos. Minimum values in the Finnish study occurred during summer months and were ascribed to low utilization of reindeer by the Lapps and the seasonal low of ^{137}Cs concentrations in reindeer flesh at that time. Average values in Anaktuvuk Pass Eskimos are about the same as those reported in the Reindeer Breeder Lapps. The greater estimated intake of ^{137}Cs by way of caribou flesh by the Eskimos is compensated for in the Lapp diet by their consumption of fish and milk containing significant ^{137}Cs concentrations.

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PREPARED STATEMENT OF BENNIE LEVY, LAS VEGAS, NEV.

My name is Bennie Levy. I reside in Las Vegas, Nevada. I worked at the NEvada Test Site from the early 1950's until the late 1970's and was involved in most of the experiments. I witnessed most of the surface shots and many of the ventings of underground tests during those years.

During the early 1950's I was sent in on re-entry operations within one-half hour to one hour after shots were detonated. This required me to go close to ground zero to pick up instruments and material used to monitor the experiment. Also, I was required on many occasions to go into ground zero days after the experiment to remove the contaminated steel and other debris and haul it to storage dump areas. This material was highly contaminated and had to be buried. There are many of the burial dumps around the test site.

There is no question that in the course of these operations I received levels of radiation far in excess of safe levels. What concerns me even more as I look back now over those years is that I was working in a dusty basin in which the debris from over 100 surface shots and many vented underground tests was constantly recirculated in the air.

Like all of my coworkers I ate my lunch out in the forward areas where there was contamination. On occasions monitors would come by with geiger counters and get readings on my lunch pail or tools. This common occurence leaves no doubt in my mind that I was breathing and swallowing radioactive debris all the time. We had no facilities to wash our

hands or face and we could not leave the contaminated areas for lunch as that would take an extra thirty minutes. Although we were assured that there was no danger, I thought it was a bit curious that supervisors and AEC personnel did not remain in the area. I questioned them on various occasions and was told that they did not have to remain.

In 1956 I was over-exposed in an operation in which I was required to go down a hole to hook up a plug. I was also highly contaminated in December 1955 while working in area 11. I was never told the amount of exposure, but I was told that plutonium was dangerous and that the smallest perticle could remain in your body the rest of your life. I now know that they could not measure the plutonium I got or the other people that worked in area 11 in the mid fifties.

I do know now that over twelve square miles of the test site was contaminated from plutonium scattered from those early experiments and that the areas will be contaminated for the next 24,000 years. An article I brought with me tells about the alpha radiation. We used to joke about the "alphies" getting you or about old mean "pluto." Little did I realize that plutonium was probably the most dangerous form of radiation to which I could be exposed.

There were individuals exposed to plutonium in 1956 who died within weeks of their exposures under circumstances which still remain mysterious. I brought with me a newspaper clipping describing the incident involving one of those.

In the early 1960's when underground shots were fired in the tunnels, I was involved in operations which

caused me to be exposed on many occasions. At "T" tunnel our shop was set up in a bunker right in the path of several shots that sent debris over us. There were vents of "I" "J" and "K" tunnels which scattered radiation over the area and signs were posted, but we continued to work in these same areas as if there was no danger at all.

There are very serious questions about the accuracy of the readings of radiation exposure to which I and my fellow workers were exposed. Measurements in the early 50's were sposmadic and incomplete. Alpha readings were not taken, even though one-fifth of the test site is contaminated with plutonium. My personal readings from such measurements as were taken shows 8 thousand 920 millirems, a figure which I believe is far below the actual amount.

What is of greater interest is the number of my fellow workers who have died of cancer or leukemia. In nearly thirty years of operation at the test site no effort was made by the government to study the effect of radiation on the workers. In fact, any suggestion that radiation had caused cancer was fought bitterly. It will now be studied with or without government aid. In my own craft, the ironworkers, I do not need to be told that cancer has been caused by radiation. I have seen my fellow workers die before my very eyes. I know that 13 of them have died of cancer, and two of those were leukemia. This is out of a group I estimate at about 300 for the years involved.

It seems to me that if there is to be compensation for the victims of radiation, that compensation should apply to those who worked in the most radioactive place in the entire

world, the Nevada Test Site. Those who worked in contaminated areas during the 1950's and 1960's prior to the containment of all tests underground, most definitely received doses which could have produced cancer and may still do so.

The amendment to S1865 will not produce thousands of addtional claims. In fact, it is unlikely that there were more than 300 to 400 cancers among those workers. I know of only about 120 who have died of cancer and about 50 who are living with cancer and I have been searching for two years. As I am sure you know, there are only three categories of cancer which are accepted as probably radiation related: leukemia thyroid, and bone cancer. I know of fewer than 30 in all three categories . The other types of cancer will be investigated by a special panel and those claims will only be allowed if investigation by experts points to a relationship. If it is determined that those were probably caused by radiation exposure it seems only right that the government should accept full responsibility. There is no other avenue available to the widows and children, who have been put through the expense of a slow and painful cancer death and are then left penniless.

I served overseas in World War II in the malaria infested jungles of the South Pacific in the defense of my country. I served in the defense of my country at the test site while defense programs were set up to test nuclear weapons. In my mind there is no difference between the two, except that the government has refused to take care the victims of one as opposed to the other, while we are prepared to care for over 100,000 cuban refugees. The cost of caring for these Nevada

Test Site Victims is but a small part of the obligation which our government has undertaken for the refugees. As an American citizen, I think we have our priorities turned upside down if we ignore those men and their families who gave their lives to the development of the most important part of our defense: the nuclear arsenal.

Senator HATCH. The subcommittee stands adjourned.
[Whereupon, at 1:10 p.m., the subcommittee was adjourned.]

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